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Handbook to Victoria.

British Association for the
Advancement of Science.

Australian Meeting, 1914.



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BRITISH ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE
AUSTRALIAN MEETING 1914

HANDBOOK TO VICTORIA

PREPARED FOR THE MEMBERS OF THE "BRITISH ASSOCIATION
FOR THE ADVANCEMENT OF SCIENCE," ON THE OCCASION
OF THEIR VISIT TO VICTORIA, UNDER THE
DIRECTION OF THE VICTORIAN
EXECUTIVE COMMITTEE.

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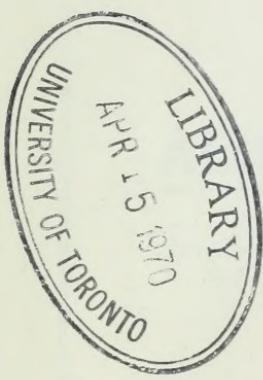
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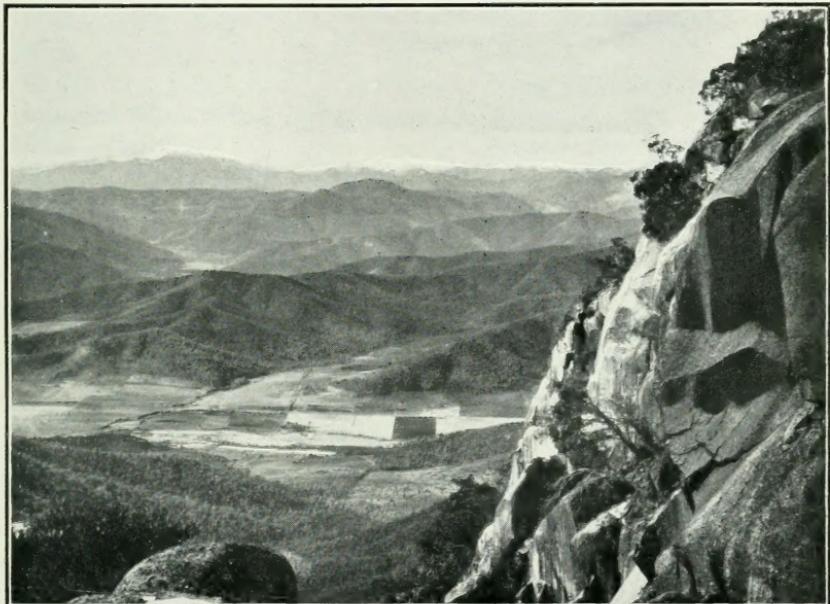
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THE BUCKLAND VALLEY FROM MT. BUFFALO.



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CONTENTS.

	PAGE
EXCURSION TO—	
BACCHUS MARSH	1
MARYSVILLE	3
WARBURTON AND CEMENT CREEK	4
MACEDON DISTRICT	6
EMERALD	8
BALLARAT AND DISTRICT	10
BENDIGO AND DISTRICT	15
NATIONAL PARK	21
CENTRAL RESEARCH FARM, WERRIBEE	23
IRRIGATED AREA, BACCHUS MARSH	25
PLACES OF INTEREST	26
INTRODUCTORY—	
THE PROBLEMS IN THE STATE OF VICTORIA WHICH AWAIT SCIENTIFIC SOLUTION	Dr. J. W. Barrett 29
POPULATION AND IMMIGRATION—	
VICTORIA'S POPULATION	A. M. Laughton 70
IMMIGRATION INTO VICTORIA	S. Whitehead 94
EDUCATION—	
EDUCATION IN VICTORIA	M. P. Hansen 103
VICTORIAN LIBRARIES, MUSEUMS, AND ART GALLERIES	Professor Baldwin Spencer 138
LOCAL GOVERNMENT AND PUBLIC WORKS—	
LOCAL GOVERNMENT IN VICTORIA	C. H. Meaden 154
PUBLIC WORKS IN VICTORIA	Colonel J. Monash 187
LABOUR LAWS AND SOCIAL CONDITIONS—	
VICTORIAN LABOUR LAWS	H. M. Murphy 203
PROVISION IN VICTORIA FOR SICKNESS, UNEMPLOYMENT, OLD AGE, AND DEATH	J. Ley 213
PUBLIC HOSPITALS AND CHARITIES OF VICTORIA	T. E. Meek 221
THE PENAL SYSTEM OF VICTORIA	G. F. Dicker 233
LAND SETTLEMENT AND AGRICULTURE—	
CLOSER SETTLEMENT IN VICTORIA	F. E. Lee 244
IRRIGATION IN VICTORIA	Dr. Elwood Mead 255
AGRICULTURE IN VICTORIA	Dr. S. S. Cameron 269
FORESTRY—	
FORESTRY IN VICTORIA	H. Mackay 310
MINING AND GEOLOGY—	
ECONOMIC GEOLOGY AND MINERAL RESOURCES OF VICTORIA	H. Herman 334
SCIENTIFIC AND TECHNICAL SOCIETIES IN VICTORIA	376
LEADING STATISTICS OF THE STATE	377
INDEX	379

LIST OF ILLUSTRATIONS.

	PAGE
The Buckland Valley, from Mount Buffalo..	iii
Murray River, Corryong..	xiii
Gold Mining ..	13
Bendigo Gold Mine ..	19
Lake Catani, Mount Buffalo ..	26
Fairy Cave, Buchan ..	27
Nyora Gully, Healesville ..	43
Gold Mining—Hydraulic Sluicing..	55
Walhalla ..	57
Church of England Grammar School, Melbourne ..	63
Types of Victorian Natives—Girls at Physical Drill..	83
" " " Boys watching Football Match ..	92
A Picture Lesson ..	110
School at Buln Buln, Gippsland ..	112
Elementary School, Canterbury ..	114
Infant School at Port Melbourne ..	115
Kindergarten Classes in the Hall of an Infant School ..	116
Teachers' College, University Grounds, Carlton ..	117
Agricultural High School, Ballarat ..	121
Xavier College, Kew ..	123
Church of England Grammar School, Geelong ..	125
Methodist Ladies' College, Kew ..	126
School of Mines, Bendigo ..	129
Wilson Hall, Melbourne University ..	131
A Garden Walk, " ..	134
The Cloisters, "	134
Interior of Wilson Hall, Melbourne University ..	134
Ormond College ..	136
Public Library Buildings, Swanston-street front ..	139
View of Interior, Public Library ..	140
Jeanne D'Arc ..	141
St. George and the Dragon ..	142
Public Library—Under the Dome ..	145
View of Interior, Stawell Gallery ..	147
National Museum—Ethnological Collection ..	149
" " Natural History Collection ..	153
Exhibition Building, Melbourne ..	189
Central Railway Station, Flinders-street, Melbourne ..	194
The Lawn at Flemington ..	202
Melbourne Hospital ..	222
Creswick Hospital ..	224
Melbourne Benevolent Asylum ..	227
Heatherton Sanatorium ..	230
Collins-street, Melbourne ..	232
Parliament House, Melbourne ..	243
Typical Gippsland Hill Country ..	245
The Combined Harvester at Work ..	247
Building a Haystack with Elevator ..	248
A Closer Settlement Farm ..	250
Scene on a Dairy Farm ..	251
Two Weeks' Growth of Lucerne at Rochester ..	258
Irrigation Pumping Plant and Farm Ferry ..	259
After Third Year of Settlement at Shepparton ..	262

	PAGE
The Goulburn Weir at Nagambie .. .	266
Main Channel, Goulburn to Waranga Reservoir .. .	268
“ Broad Agriculture ” .. .	278
Harvesting Onions .. .	280
Government Stallion Parade .. .	285
The Popular Wheat of Australia, “ Federation ” .. .	291
“ Farmers’ Field Day,” Central Research Farm, Werribee .. .	292
Grading Land for Irrigation, Central Research Farm, Werribee .. .	293
Rotation Cropping, Rutherglen Experiment Station .. .	294
Testing Varieties of Wheat for Prolificacy .. .	295
Breaking Virgin Country .. .	297
A Flourishing Orchard District .. .	300
Giant Mountain Ash Trees .. .	311
“ King Edward ”—Giant Tree at Marysville .. .	315
Stand of Pole Timber .. .	320
State Nursery—Creswick Plantations .. .	321
Monterey Pine .. .	324
Creswick State Nursery and Plantation .. .	333



MAPS, PLANS, DIAGRAMS, ETC.

	PAGE
Map of Victoria	xvii
Chart—Wet Bulb Isotherms	31
Map—Victorian Agricultural Zones	47
Diagram—Movement of Population in Victoria	75
General Plan of Grounds of a Rural School	113
Irrigation Allotments, Werribee Estate	257
Goulburn Irrigation Works	263
Map of Victoria, showing Production Areas	273
Deep Leads of Victoria	335
Geological Map of Victoria	337
Contour Map of Victoria	343
Transverse Section of Ballarat East Goldfield	350
“ “ “ West	351
Plan of Daylesford Goldfield	354
Transverse Section of Daylesford Goldfield	355
“ “ Ajax Mine, Daylesford	355
“ “ North Nuggety Ajax Mine, Daylesford	356
Plan of Anticlinal Axial Lines at Bendigo	357
Transverse Sections of Bendigo Goldfield	359
Longitudinal Sections, Principal Axial Lines of Reef, Bendigo	360
Vertical Projection, Hustler's Line of Reef, Bendigo	361
Transverse Vertical Section, Great Extended Hustler's Shaft, Bendigo	362
“ Section, Castlemaine Goldfield	363
Section of Walhalla Goldfield	364
Longitudinal Vertical Projection, Cohen's Line of Reef, Walhalla	365
Transverse Section, New Loch Fyne Mine, Matlock	366
Section, Auriferous Sub-Basaltic Deep Lead at Trawalla	367
“ across Dargo High Plains	368
Sections, State Coal Mine, Wonthaggi	369
Section of Jumbunna Coal Mine	370
“ across Latrobe Valley, Traralgon	371
“ “ Corner Inlet	371





MURRAY RIVER, CORRYONG.



PREFACE.

The main object which has been kept in view in the preparation of this handbook is to furnish the members of the British Association who are visiting Victoria with a brief account of the physical conditions existing in the State, of its natural resources, and of the steps which are being taken by the Government to develop these resources and to promote the well-being of the people.

The introductory article is of a comprehensive nature, and deals with a number of practical problems in the State which await scientific solution. The views expressed by the author have been given after consultation with a number of experts in Government Departments and elsewhere. The second article contains information relating to the inhabitants of Victoria, and shows their distribution as regards locality, age, nationality, race, &c. The immigration policy of the Government is described in a special chapter. Educational institutions are next dealt with, and this subject is followed by a description of the public libraries, museums, and art galleries. In the succeeding section there is a full account of the system of local government, after which there is an article giving details of the public works which have been undertaken by the Government, the municipalities, and other public bodies, and showing the nature of the difficulties which are met with in carrying them out.

The next section deals with the social conditions existing in the community. The Wages Board system is fully described, and particulars are given of other provisions which exist for the purpose of ameliorating the conditions of labour. Statistics are published showing the number of persons employed in different trades, the average wages paid, the value of the output, &c. This section also contains an account of the provision made by or on behalf of workers for sickness, unemployment, old age, and death, as well as descriptions of the public charities and penal establishments of the State.

The following section relates to rural industries. For a number of years past the Government has been taking steps to facilitate the acquisition of land by persons of limited means. The system in operation is described in a chapter on Closer Settlement. Closely allied to this subject is that of Irrigation. This is treated of in a contribution by the Chairman of the State Rivers and Water Supply Commission, who shows the beneficent results that have followed from its adoption in districts that are subject to

limited rainfall. The succeeding article treats of agricultural production, and includes an account of the various steps which are being taken by the Government to assist farmers and to increase productivity.

The last two sections deal with matters of great interest to the scientist—the conservation of the State's forests and the nature of the timbers found therein, and the economic geology and mineral resources of the State.

Most of the articles were written towards the end of 1913, and the statements made usually refer to the conditions existing at that time. Many of them contain photographs, diagrams, and maps illustrating the subjects dealt with. There are, in addition, distributed throughout the book, a number of illustrations of scenery and buildings. At the beginning of the volume is a map which will be found useful for reference, and at the end there is a list of the principal scientific and technical societies in Victoria, followed by a table containing the more important statistics of the State. The editors are of course not responsible for opinions expressed in the articles.

A number of excursions have been arranged to take place during the visit of the Association. The book contains in respect of most of these full descriptions of the places to be visited and of the country which will be traversed in reaching them.

While the articles appearing in this volume have been prepared primarily for the benefit of the visiting members of the British Association, it is anticipated that they will serve a much wider purpose, and that they will be found of value to all persons who are interested in the welfare of the State.

THE EDITORS.





Though there is a decided basin-shaped area which has been deeply infilled around the township in recent times, it has certainly not been known to man in the marshy condition. Leaving the Marsh, an interesting ascent is made



EXCURSIONS.

GEOLOGICAL EXCURSION TO BACCHUS MARSH.—SATURDAY,
15TH AUGUST, 1914.

Leaders—Dr. T. S. Hall, M.A., and Dr. G. B. Pritchard.

PROGRAMME (Times to be arranged).

Depart Spencer-street.

Arrive Ballarat Plateau (Gatehouse 24).

Arrive general view point of Gorge.

Descent to Werribee River.

Examine glaciated floor, conglomerate, &c.

Lunch.

Ascend Gorge, Examine Ordovician Dykes, Glacials, &c.

Ascend to Upper Shelter Shed.

Leave by conveyances for Bacchus Marsh.

Dine at Bacchus Marsh.

Leave Bacchus Marsh.

Arrive Spencer-street Railway Station.

NOTES ON THE GEOLOGY OF THE BACCHUS MARSH
DISTRICT.

By G. B. Pritchard, D.Sc., F.G.S.

On this excursion the first feature to call for note is the lava plain, some 30 miles of which will be passed over *en route* to Bacchus Marsh. The rock is generally described as basaltic, but considerable variations are shown from the tachylitic to the doleritic type. Dotted over the surface of this lava are several mounds or volcanic hills of a few hundred feet elevation above the surface of the plain, which itself rises to the north about 500 feet in 40 miles from the present sea-board. These hills are usually pointed out as extinct volcanoes from which the lava of the plains has flowed, but several that I have examined appear to me a jumbled arrangement of ash, scoria, and fragments of the lava flow, and indicative of the last fitful bursts of activity rather than the vents from which the whole of the lava outpoured. The flat-topped Mt. Cotterill, on the left-hand side, passed fairly closely by the train, appears but a lift of a portion of the lava of the plain. Mt. Mary, also in this neighbourhood, shows huge fragments of fossiliferous Tertiary limestones of marine origin as the immediately underlying deposit. After the Melton railway station has been passed, an interesting deserted creek bed may be noticed, together with the thickness and appearance of the lava at that spot.

Bacchus Marsh railway station is 32 miles from Melbourne, and is 343 feet above sea-level. The name of Marsh is somewhat misleading, for, though there is a decided basin-shaped area which has been deeply infilled around the township in recent times, it has certainly not been known to man in the marshy condition. Leaving the Marsh, an interesting ascent is made

to the Ballarat plateau, over a lava flow modification of a fault scarp, and the point of alighting from the train is about 1,180 feet above sea-level. From this plateau a fine panoramic view of the surrounding district may be had, and the more important features will be pointed out. The Werribee River has here opened up the country in an exceptionally interesting manner for the geologist, and the sequence of rocks below the basalt capping can be very clearly followed. Here and there an old river gravel is preserved, or an ancient lake deposit of tertiary time with its fossil leaves and fruits. One of the most interesting deposits opened out is the old glacial conglomerate, some 500 feet of which may be examined in the gorge, but in an adjoining tributary stream of the Werribee, named the Korkuperrimul Creek, the whole of the glacial beds and their associated sandstones are laid bare in about four miles of its course north of the main Ballarat road, probably representing a thickness of at least 1,000 feet. The Bacchus Marsh sandstones are well known from several points of view; they were at one time used in Melbourne as a building stone, but for this purpose they proved highly unsuitable; their value geologically is that through their fossil contents containing representatives of the *Gangamopteris* Flora their age can be stated as Permo-Carboniferous. Valuable correlations with New South Wales, India, and elsewhere can thus be made out, and interglacial mildness thus confirmed. The association of a peculiar conglomerate with these sandstones was early recognised by Mr. A. R. C. Selwyn as probably pointing to glacial conditions, but the first glaciated stones were brought forward by Messrs. G. Sweet and C. Brittlebank. Evidence of the glacial origin of these deposits thus went on accumulating for years, and, though much doubt was expressed by many for a long time, we may now safely assert a universal acceptance of their mode of origin. This glacial material has an economic value, for much of it has been washed and bleached for ages, and sized and re-deposited by river action, and has accumulated on the flanks of Bald Hill, Darley, in a form eminently suited for the various purposes of the Darley Fire Brick Company.

The glacial deposits rest unconformably in a deep depression in the bedrock of the district of Ordovician age. These rocks, which show many fine exposures in the Werribee Gorge, consist of shales, slates, sandstones, quartzites, and several of the dark coloured bands in the road cuttings and railway cuttings on the plateau towards Inglinton, as well as one or two spots in the gorge, may be made to yield up very fair collections of graptolites. Some very fine examples of folding and cleavage may be examined, as well as igneous intrusions of the quartz-porphry type. The granite which outcrops near Inglinton and that on the Myrniong Creek can also be seen to be intrusive into the Ordovician, and may possibly be contemporaneous with Devonian intrusions of this character elsewhere in Victoria.

The surface of the Ordovician rocks, especially where quartzitic, has retained some fine evidence of glacial action in its polished, striated, and grooved character, and some small exposures of this feature are looked upon as show spots of the gorge.

In a brief account such as this, justice can hardly be done to such a fine section, and no reasonable appreciation can be gained of the innumerable points of interest without an actual visit.

WEEK-END EXCURSION TO MARYSVILLE.—SATURDAY.

15TH AUGUST—MONDAY, 17th AUGUST, 1914.

Leader—Mr. J. M. Reed, I.S.O., Surveyor-General.

MOTOR CARS KINDLY PROVIDED BY THE AUTOMOBILE CLUB OF VICTORIA.

Programme (Times of starting and returning to be arranged).

Start from Flinders-street, opposite to the Cathedral.

Arrive Marysville. Lunch at "Kerami."

Motor along Wood's Point-road to Tommy's Bend. See Cumberland Falls.

Return to "Kerami."

16th August.—Visit various points in the picturesque Taggerty Valley by motor and on foot.

17th August.—Leave for Coranderrk Aboriginal Station in morning on return journey to Melbourne.

NOTES ON THE MARYSVILLE DISTRICT.

This excursion will afford visitors a very favorable opportunity of viewing a portion of Melbourne's suburban area and the environs of the city, followed by an interesting journey on a good motor road through orchard and dairy country, and the prettily situated township of Lilydale, up the valley of the Yarra, by Yarra Glen township, and on to Healesville, a favorite tourist resort on the bank of the Watts River, thence rising into high country by a very fine mountain road running through typical forest of giant eucalypts, passing groves of beech, blackwood, sassafras, and silver wattle, over the Blacks' Spur at a height of about 1,800 feet, and on to Marysville, which has been described as "A Tourists' Paradise."

Leaving Melbourne the route traverses the suburbs of Kew, Camberwell, Surrey Hills, and Box Hill (9 miles), passes Blackburn, Mitcham, Ringwood, Lilydale (24 miles), Yarra Glen (31 miles), Healesville (40 miles), Narbethong (53 miles), to the objective at Marysville (61 miles), at an elevation of about 1,600 feet above sea-level. For the whole distance the journey will prove of interest, and the traveller will see varied types of country, interesting from both productive and scenic points of view.

Healesville, nestling at the foot of the mountains is, as indicated, much favoured by tourists. The Coranderrk Aboriginal Station is distant about three miles to the south. Here, under the control of the State, provision is made for many of the survivors of the natives of this country, who enjoy perfect freedom, and are well cared for.

Some miles above Healesville is the Maroondah Weir, on the Watts River, this being the offtake of a considerable portion of the water supply to the City of Melbourne. From the crossing of the Watts River the road rises rapidly. This ascending highway is one of the best in Victoria, and from points along its course very fine views are obtainable, while the foliage is varied and very interesting, particularly in the fern gullies in close proximity to the road. A well-known landmark is "The Hermitage," truly described as an "Artists' Home," where Mr. Lindt, the proprietor, has carved out of the forest a completely equipped and delightful resort. Continuing the journey, the Narbethong Hotel is passed, then the popular accommodation

house of St. Fillan, which for many years has provided for the enjoyment of large numbers of visitors. The journey terminates at "Kerami," an excellent house, conducted by Miss Glover, a lady who has done very much to popularize the attractions of this district. From this home excursions may be made on foot or otherwise, along the Wood's Point-road, which in a short distance reaches an altitude of between 4,000 and 5,000 feet, to the Steavenson Falls, or along the Taggerty Valley by an easy tourists' road named the "Talbot Drive," after a former Governor of the State. This valley is one of the finest features of the district, and is not surpassed anywhere in Victoria. Along the drive, which closely follows the stream, the scenery is of great beauty, and various sections bear the appropriate and suggestive names of "The Valley Beautiful," "The Forest of Arden," "The Meeting of the Waters," &c.

No tree in our dense forests excels in beauty of foliage, or in form and colour, the beech tree, which here flourishes to perfection. The dark green of magnificent old beech trees, hoary with age, and of the shapely blackwoods, contrasts with the lighter green of the sassafras and the silver tint of the wattle trees.

Towering above all are the giant eucalypts—blackbutt variety—and below is a rich green carpet of fern fronds. The stream for much of its rocky course is a succession of cascades, miniature falls, and rapids.

For an enjoyable outing, and one enabling the visitors in a brief time to see much that is interesting and beautiful, this excursion may be confidently recommended.

EXCURSION TO WARBURTON AND CEMENT CREEK.—
SATURDAY, 15TH AUGUST, 1914.

Leaders—Dr. C. S. Sutton and Mr. Cuming.

Train starts from Melbourne (Flinders-street); time to be arranged.

The route to be taken by the excursionists to Warburton and Cement Creek—into the country of tall trees and tree-fern gullies—runs east through one of the three very distinct plant formations covering the area surrounding the City of Melbourne. The vegetation of the area has been determined mainly by the nature of the soil, the climatic conditions varying only in slight degree.

To the north and west of the city, covering the basalt plains, with a dark tenacious soil watered by a rainfall averaging less than 20 inches, is a steppe-like growth of short grasses and herbs, with trees almost confined to the water-courses, especially when these take a canyon form, as in the Saltwater River and its branches. This may be taken as an index of the cover of the great lava flows which extend nearly to the western border of the State.

To the south-east the loose sandy soil of the "red beds" area, with a somewhat greater rainfall, averaging 27 inches, supports a more varied and attractive flora. Here the predominance of the smaller members of the myrtle family and several epacrids has led to the locality being generally known as the "heath grounds." Tall shrubs and medium-sized trees also occur, and a growth similar in character is found extending disconnectedly

along the coast, even as far as Cape Howe. To the north and east the Silurian formation is marked by forest growth, but, although the rainfall is greater than in the other localities, averaging rather less than 30 inches, the trees are still of moderate height. In places they are close set, but in others the country is open and savannah-like. Through this the railway runs 23 miles to Lilydale, at the foot of the hills, a prettily situated town, the home of, perhaps, the best known of all Australians, Madame Melba.

From Lilydale, with an elevation of 322 feet and a rainfall of 25 inches, the line mounts in a few miles to its highest point, 738 feet, at Olinda, with 46 inches average rainfall. From here onward to Warburton, 47 miles from Melbourne, the vegetation is much richer, and frequent glimpses may be obtained of fern gullies and tall timber.

Arrived at Warburton the party will be conveyed by vehicles six miles along the road newly-made to the top of Mount Donna Buang, and, as the gradual ascent is made, charming views of the Upper Yarra Valley will be obtained. Very soon the aqueduct conveying the waters of the O'Shanassy River to augment the supply of Melbourne will be crossed, and the sub-alpine flora commence to appear.

With a rainfall as high as 60 inches and precipitation occurring on more than half the days of the year, the vegetation is naturally luxuriant. There being no very marked seasonal change, all the trees are evergreen, and for the same reason the forest is perhaps open to the charge of being somewhat monotonous. The one tree markedly predominant is *Eucalyptus regnans*, the giant gum or mountain ash, as it is locally called, which gives the township of Warburton the means of being one of the centres of the saw-milling industry. Many species of the genus *eucalyptus* exceed 200 feet, but *Eucalyptus regnans* occasionally measures more than 300. It has often been asserted that it is the tallest tree in the whole world, though it probably shares this distinction with the gigantic redwood of North America. The value of this tree will be recognised when it is stated that, from an area of 12 acres near Warburton, timber worth £5,000 was sawn in nine months by a mill working 24 hands, and that a single tree at Neerim yielded 10,000 6-ft. palings, worth £115. The tree also quickly re-establishes itself on cleared and burnt ground, and in the Britannia Creek young forests may be seen which have attained an average height of 20 feet in three years. Some of the millers also assert that in fifteen years such a young forest will afford them trees averaging 2 ft. 6 in. in diameter, and really more suitable than those at present being felled, many of which are over-mature, and, though outwardly appearing sound are yet much affected by white ants.

Another tree occasionally seen and furnishing a very beautiful timber much used in cabinet making is the blackwood (*Acacia melanoxylon*). Many other acacias occur which glorify the bush with colour and scent in early spring. Filling in the spaces between the giant gums are many shrubs, the most noticeable and characteristic of the situation being the mountain pepper (*Drimys aromatica*), the musk aster (*A. argophyllum*), the sandfly zieria (*Z. Smithii*), the hill tree-fern (*Alsophila australis*), a giant among ferns, as is also its brother of the lower slopes of the valley, *Dicksonia antarctica*; the elderberry ash (*Panax sambucifolius*), the Christmas bush (*Prostanthera lasianthos*) the austral indigo (*Indigofera australis*), and many of the

Proteaceæ and Leguminosæ. Grasses are not strongly represented in the forest, but two species are so often in evidence that they cannot fail to attract attention. One of these is the wire grass (*Tetrarrhena juncea*), frequently forming such dense entanglements in the scrub as to make a passage through it difficult and troublesome. The other is the mountain sweet grass (*Glyceria dives*), often attaining a height of 8 to 10 feet. In its young state this makes good feed for stock, and it is due to a desire to promote its growth that the forest is so often fired, with the resulting destruction of much valuable timber.

When at last Cement Creek is reached, a fairly typical specimen of a mountain gully can be examined. Here the evergreen beech (*Fagus Cunninghamii*) is supreme in beauty of foliage and bole covered with mosses, lichens, and fungi. This fine species also occurs in Tasmania, which has also the deciduous *F. Gunnii*, closely akin to a South American form, but in New South Wales its place is taken by the somewhat similar *F. Moorei*, the niggerhead.

No gully is without the Southern Sassafras (*Atherosperma moschatum*), with fragrant white flowers curiously down-turned. The closely allied austral mulberry (*Hedycarya Cunninghamii*), the hazel pomaderris (*P. apetala*), and the banyalla (*Pittosporum bicolor*), of a genus better represented in New Zealand than here in Australia, and the composite blanketwood (*Bedfordia salicina*) are also very characteristic of such localities. Lianes are not numerous, those of strongest growth being the *Clematis aristata*, which often forms dense masses of ivory white blossom high up among the trees, *Lyonsia straminea* and the charming wonga vine (*Tecoma australis*), just here approaching the western limits of its distribution. Epiphytes are rare, but the trunks of the *Alsophilas* are often covered with the fern club-moss (*Tmesipteris Tannensis*), *Trichomanes*, *Hymenophyllums*, and *polypodys*; while members of the genera *Gleichenia*, *Blechnum*, *Aspidium*, and *Asplenium* are abundant on the ground.

A certain misguided writer once stigmatised this country as a land where the flowers were without scent and the birds without song.

Australia has probably long since lived down this calumny; but if, perchance, any of our visitors comes to us with such an impression, inhales the fragrance of the acacias, and the aroma of the gums, and listens to the voices of our honeyeaters, shrike thrushes, magpies, and other notable songsters, it will surely be soon removed, and as he lunches amongst the natural beauties of Warburton the said writer's spirit will still further be confounded.

GEOLOGICAL EXCURSION TO THE MACEDON DISTRICT.—

SATURDAY, 15TH AUGUST, 1914

*Leaders—Professor E. W. Skeats, D.Sc., A.R.C.S., F.G.S. and
Dr. H. S. Summers.*

Motor cars kindly provided by members of the Automobile Club of Victoria.

PROGRAMME (Times of starting and return to be arranged).

Start from the Haymarket, Elizabeth-street.

Keilor.—Newer Basalt plains: incised meander of Saltwater River through Newer Basalt. Tertiary sands, and Older Basalt into Silurian; good monoclonal fold in Silurian Sandstones on left-hand side near bridge.

*Gisborne.**Macedon Railway Station.*

Turritable Falls, Upper Macedon.—Stop at *School House*, walk 300 yards west to falls over anorthoclase trachyte lava flow proceeding from vent above Upper Macedon.

Drive past *Government Cottage* west and then north-west along new road towards Woodend. Cuttings in hill wash of dacite, and later of altered Ordovician shales and sandstones.

Arrive *Braemar House*: examine granodiorite in tennis court and above house; examine also Braemar type of dacite.

Lunch at Braemar House.

Leave for Brock's Monument, passing Hesket and north end of Black Range (Kerrie conglomerate).

Arrive *Brock's Monument* (plug of solvsbergite). On leaving return to Hesket, thence towards Hanging Rock, past King's Quarry (limburgite).

Arrive *Hanging Rock* (plug of solvsbergite rising 300 feet above surrounding anorthoclase trachyte). Go north one mile to Newham, then west past south side of Jim-Jim (composite volcano of anorthoclase trachyte with later flow of andesitic basalt) to Sugar Loaf Hill (olivine anorthoclase trachyte resting on anorthoclase basalt). Visit Race-course Hill (woodendite).

Dinner at Commercial Hotel, Woodend.

Return to Melbourne after dinner.

GEOLOGICAL HISTORY OF THE MACEDON DISTRICT.

The geological history of the area commenced with the deposition of Lower Ordovician shales and sandstones belonging to the Castlemaine and Dariwil horizons. In the interval between the Lower and Upper Ordovician periods these may have been folded by earth movements, for the Kerrie conglomerates of basal Upper Ordovician age appear to rest unconformably upon them in the eastern part of the area.

In the extreme south-east, near Riddell's Creek, Silurian fossils have been recorded. Folding, along axes trending west of north, took place probably in Lower Devonian times, and was followed first by the intrusion and eruption of the dacites of Mt. Macedon, and then by the intrusion of granodiorite and granodiorite porphyry in the eastern part of the area. The intrusive part of the dacites has altered the Lower Ordovician sediments near Upper Macedon to some extent, while the granodiorites have caused more decided metamorphism of these rocks in the eastern part of the area, and have also intruded and altered the Kerrie conglomerates, and altered the dacite near its junction with the granodiorite.

From the Devonian to the Mid-Kainozoic or Late Kainozoic periods the area remained a land surface, and was subjected to prolonged erosion.

The vestiges of an older Kainozoic peneplain may possibly be traced in the almost level summit of the Macedon ridge, which is now at an elevation of slightly over 3,000 feet. Succeeding elevatory earth movements caused the erosion to become differential, so that the Lower Ordovician sediments

were reduced to a level of 1,500 to 1,800 feet above sea-level. Accompanying or following these movements of elevation eruptions of alkali rocks occurred in the district, forming in probable sequence lava flows of anorthoclase trachyte, plugs of solvsbergite, and lava flows of anorthoclase basalt, a new rock type macedonite allied to the mugearites, another new type woodendite, anorthoclase olivine trachyte, olivine anorthoclase trachyte, and limburgite. The volcanic history of the district closed with the eruption of the normal newer basalt, succeeded by andesitic basalt. All these types are believed to have arisen by differentiation of two kinds, the majority by normal serial differentiation before crystallization, while the macedonite, woodendite, and anorthoclase basalt are believed to have been produced by complementary differentiation, at least partially after crystallization of some of the mineral constituents.

The pouring out of the volcanic rocks altered the drainage relations of the area, and the slight recession of the Turritable waterfall at Upper Macedon, amounting to less than 400 yards, suggests that the lava flow of anorthoclase trachyte, on which Upper Macedon is built, and which filled up an earlier valley carved in dacite, may be of Upper Cainozoic age. Part of the main divide of Victoria runs through the Macedon district, striking north from the Camel's Hump across the plateau of Lower Ordovician sediments and Cainozoic volcanoes and lava flows to the granite ridge of the Cobaw Ranges. On this plateau to the north of Mt. Macedon the drainage is ill-defined, and creeks which eventually run north into the Murray for a time trend in a southerly direction, while others which ultimately run south into Port Phillip for a time trend in a northerly direction.

EXCURSION TO EMERALD.—SATURDAY, 15TH AUGUST, 1914.

Leaders—Professor A. J. Ewart, D.Sc., and Mr. R. Grimwade, B.Sc.

PROGRAMME (Times of trains to be arranged).

Train starts from Flinders-street, returning on the evening of the same day.

The route is by an ordinary passenger train through the suburban towns of Camberwell and Box Hill to Ferntree Gully. The line rises several hundred feet to Box Hill, and thence through gently undulating orchard and pastoral country passes to Ferntree Gully. This famous gully is enclosed in a large park, and at the head of the gully is a look-out, from which very fine views of the surrounding country can be obtained. A change is now made to the narrow-gauge mountain railway passing through Upwey, Belgrave, Selby, Aura, and Paradise to Emerald. From Belgrave there is a coach route to Sassafras, renowned for its beautiful scenery, and so called after the Southern Sassafras (*Atherosperma moschatum*), which is abundant in the neighbouring valleys.

As the train winds in and out of the mountain ranges and skirts their flanks, fine views are obtained of fern and forest clad valleys and mountain sides. At several points vistas of the surrounding country can be seen extending for miles towards the sea. At this time of the year comparatively few native plants are in flower, but in a favorable season many of the

acacias are covered with yellow bloom, and the red or white flowers of the common heath (*Epacris impressa*) may be seen among the undergrowth. The three commonest acacias of the district are the Silver Wattle (*Acacia dealbata*), which grows into a tree 30 feet high; the Prickly Acacia (*Acacia verticillata*), which is a shrub up to 10 feet high, with pointed phyllodes; and the smaller spreading Acacia (*A. diffusa*). The yellow and red flowers of the half-shrubby Bush Peas (*Pultenaea*), Parrot Peas (*Dillwynia*), the red flowers of the Flat Pea (*Platyllobium*), and the purple flowers of the variable Hovea usually appear later in the season.

Among the *Myrtaceæ*, the chief Eucalypts are the grey gum (*Eucalyptus goniocalyx*), the narrow-leaved peppermint (*E. amygdalina*), the messmate (*E. obliqua*), and the red stringybark (*E. macrorrhyncha*). The messmate is a valuable timber tree, attaining a height of 150 feet, while the rather shorter red stringybark has an excellent fissile timber, used for posts, palings, rails, &c. The white flowers of these gums, of the shrubby manuka tea-tree (*Leptospermum scoparium*), and of the scented paper bark (*Melaleuca squarrosa*) are, however, not borne till later in the year, but old fruits from previous seasons, in some cases with still unshed seeds, may be found attached to the parent plant.

A shrubby composite, the common cotton wood (*Cassinia aculeata*), with small narrow leaves and brownish white heads of small flowers, is much in evidence, and here and there the wild cherry, Ballart (*Exocarpus cupressiformis*), may be seen. When fruiting, its red drupes and dark-green cypress-like foliage give it a striking appearance.

Although the winter in Victoria is very mild, the epiphytic orchids of the tropics are replaced, as in England, by forms whose underground stems are shielded from winter's cold. After a warm spell some of the early flowering forms, such as the nodding green-hood (*Pterostylis nutans*), and the larger Glossodia (*Glossodia major*), with tall spikes of large pale-blue or white flowers, may be seen, but the curious purplish flowers of the spider-orchid (*Caladenia Patersonii*) are usually seen later in the season.

Along the valleys and lower slopes of the mountains, in addition to many smaller ferns, two of the taller tree-ferns are to be seen, namely, the common tree-fern (*Dicksonia antarctica*), and the prickly tree-fern (*Alsophila australis*). These tree-ferns may attain a height of 30 feet or more; the former has usually the stouter stem of the two, while the latter has the main stalk of the leaf rough, or almost prickly.

Approaching Emerald the country becomes more open and cultivated. At Emerald is Mr. Nobelius's famous nursery, of some 200 acres extent, in which about $2\frac{1}{2}$ million trees are raised annually. A garden of unique interest surrounds the house, which commands a fine view from the side of a hill.

Almost adjoining the nursery is Bosisto's experimental oil farm, managed by Messrs. Grimwade and Co. In addition to various scent plants, several oil and perfume yielding Eucalypts have been planted, including *Eucalyptus McArthuri*, the Camden Woolly-Butt, which yields geraniol. For the most part, however, the plantations are still too young to yield any return.

General features that will be noticed are the blue-green or olive-green character of the vegetation when seen at a distance, the predominance of

evergreens and of *Myrtaceæ* among the forest trees, the slender unbranched trunks of so many of the trees, and the deciduous bark of some, the replacement of European heaths (*Ericaceæ*) by Australian heaths (*Epacridæ*), the frequent occurrence of phyllodes or of vertical leaves throwing little shade, and the abundance of tree-ferns. One almost characteristically Australian order, the *Proteaceæ*, is represented by a few forms only, including a small prickly Hakea. In the virgin flora the absence of green-sward is noticeable, although many tufted or straggling grasses occur. There are no native clovers, the majority of the smaller Leguminosæ being shrubby or half-shrubby in character. Of edible wild fruits there are practically none, and, although many of the leaves are hard and sharp pointed, thorns and spines are characteristically absent.

EXCURSION TO BALLARAT AND DISTRICT.—SATURDAY, 15TH—
MONDAY, 17TH AUGUST, 1914.

Leader—*Mr. Wm. Baragwanath.*

PROGRAMME (Times of trains to be arranged).

The Railway Journey.—The Ballarat train leaves Spencer-street Railway Station.

The lines to Ballarat and Bendigo diverge at Sunshine (7 miles, height 124 feet), the former in a north-westerly direction over the basalt sheet past Toolern Creek, Melton, and the Werribee Valley, where it crosses a viaduct to Parwan Creek. Several scoria cones stand out, to one of which, Mt. Mary, considerable interest attaches on account of certain ejected boulders containing Tertiary fossils at the mouth of the crater. Mt. Macedon (3,324 feet) is always visible, first to the N.N.W. and later to the N.E.

The train then enters the Bacchus Marsh Valley. A cutting beyond Parwan Creek shows a series of sands and gravels of Miocene or later age. The soil of the valley is wonderfully fertile, and several successive crops of lucerne are taken under irrigation from parts of it every year.

Bacchus Marsh (31 miles, height 343 feet) is a thriving town of some 3,000 inhabitants. Its industries are centred in milk and butter factories, limestone and building stone quarries, and china-clay pits. Located in such a fertile valley, the town is making rapid strides, and bids fair to become of considerable importance.

The country to the north of Bacchus Marsh is known to all students of Victorian geology. The Werribee Gorge, eroded through glacial conglomerate into the underlying Ordovician (Castlemaine) sediments, is striking physiographically, and a romantic piece of scenery. The surrounding eminences—Mt. Blackwood, conspicuous above the others, and Macedon, away to the north-east—provide a charming distance. The Miocene beds in the district have produced both marsupial bones and leaf fossils, and these, with the later Tertiary and Permo-Carboniferous glacial beds, give ample material for research.

From Bacchus Marsh (343 feet) the railway, by a horseshoe bend, rapidly ascends to Ingliston (1,513 feet), and enters the Ballarat Plateau. In the cutting some two miles beyond Bacchus Marsh are the Dog Trap series of sands and clays, economically useful for making glass and chinaware.

Eight miles from Bacchus Marsh the fringe of the Permo-Carboniferous glacial conglomerates is exposed in a railway cutting, and forms an unconformable junction with the Lower Ordovician. Several dykes occur, the acid series being confined to the Lower Ordovician, and the basic intrusive into the conglomerates.

About the 43-mile post the basalt sheet again appears, and the line continues on this through Ballan (49 miles, 1,666 feet) and Gordons (56 miles, 1,786 feet), where it is bounded on the north and south by the auriferous areas of Gordons and Egerton respectively.

From Gordons to Warrenheip (70 miles, 1,723 feet) several scoria cones are visible on both sides of the railway. The volcanic soil of this district is of high quality, and contributes in no small degree to the prosperity of Ballarat, some six miles distant.

From Warrenheip a steep down gradient gives a good view of the city, and leads from the eastern plateau to the Ordovician outcrop at Ballarat East. Passing over the Ballarat East Gold-field, in Ordovician slates and sandstones, the train enters Ballarat Station.

Civic Reception.—On arrival at Ballarat a civic reception by the Mayors of the City and Town will be held at the City Hall.

Inspection of City Features.—After the reception the features of the City will be inspected.

Some Facts concerning Ballarat.—The early history of Ballarat is prominently associated with the discovery of gold in Victoria, for it was at Clunes (22 miles distant) on 29th June, 1851, that Esmond found gold in the quartz lodes and alluvial deposits, and published the fact to the world. Thomas Hiscox had found gold in a gully at Buninyong in August, 1850. A party on their way to Clunes in 1851, hearing of Hiscox's find, sent some prospectors to Golden Point. Their success was the forerunner of great events, for in 1851 the gold-fields of Ballarat and Buninyong were crowded with diggers. The quantity of gold obtained was phenomenal, and a conservative estimate may be formed from the State gold yield for 1851—1,145,137 ozs., valued at over £5,500,000—nearly all of which was obtained from the Ballarat district.

The population in 1851 was 25,000. The introduction by the authorities of a "gold licence," which cost as high as 60s. a month, and the subsequent tactless enforcement of the tax, led to the Eureka Riot, on Sunday, 3rd December, 1854, which was not quelled without bloodshed.

The wealth near the surface could not be expected to last for all time, and the shallow alluvial gutters having been worked out, those beneath the basalt, as well as the quartz lodes, compelled attention. It was evident, however, that the simple methods used in the first case were useless in the second, and that the introduction of powerful plant to cope with new conditions, the consequent outlay and unavoidable lapse of time, had to be faced before returns were possible. The persistency of the miner triumphed over all difficulties, established the permanency of the field, and Ballarat took shape, quickly advancing to its position as a city, which it was proclaimed in 1870. Its history has been from the outset one of general advancement.

The population is at present about 42,000. Ballarat sends one member to the Federal and four members to the State Parliament. The area of the city is 4,090 acres, divided into three municipalities—viz., Ballarat City, Ballarat East, and Sebastopol.

Among the buildings in the city are the Hospital, Orphan and Benevolent Asylums, Women's Homes, Mechanics' Institute with Library, Fine Art Gallery, Banks, and Commercial Houses, two Town Halls, three Theatres, forty Churches, School of Mines and Museum, Agricultural High School, State Schools, &c.

The industries of Ballarat include six iron foundries, a brewery, a flour and two woollen mills, boot and other factories.

There are three daily newspapers.

At a height of 1,416 feet, the climate is temperate in summer and colder than most other Victorian towns in winter. It is therefore a health resort during the summer season. Taste and discrimination have been used in the beautification of the city. The Botanical Gardens, with their marble statuary, including Benzoni's "Flight from Pompeii," will be visited. They are situated on the western edge of Lake Wendouree, a sheet of water slightly over a square mile in area, and originally a swamp. Such public buildings as time will permit will also be visited before lunch.

Lunch.—Lunch will be at the Botanical Gardens at 1 p.m.

Afternoon Excursion.—After lunch the historic Eureka Stockade, the scene of the Eureka riot, will first be visited, and then the geological structure of the gold-field and surrounding country will be examined and explained. The route will pass the site of the gold discovery in 1851, and over some ancient river gravels to Sovereign Hill (1,560 feet), a point of vantage whence the position of the Main Divide, with its volcanic and Palæozoic hills, will be pointed out. To the east the western fringe of the Warrenheip Plateau, chiefly of volcanic origin, rises to an altitude of 1,900 feet, 500 feet above the western plateau on which the city itself is built. To the south the position of the ancient Divide will be indicated, and to the west the western basaltic plains to be traversed by motor on the following day.

The ancient river system, the leads of which have yielded such wealth to Ballarat, will be traced, and other points of interest in relation thereto dwelt upon.

Mts. Warrenheip (2,463 feet) and Buninyong (2,448 feet) form conspicuous features of the landscape, and several small flows of comparatively recent age can be traced to them.

The Gold-field of Ballarat.—The Gold-field of Ballarat is always considered under two headings—Ballarat West and Ballarat East. The Yarrowee Creek separates the two. The Little Bendigo Field is now deserted.

As elsewhere, mining problems are intimately connected with the plication of Palæozoic strata into anticlines and synclines and their subsequent denudation, which brings certain favorable beds to the surface at certain localities.

The Ballarat West Field, on which Sovereign Hill is situated, has a lode structure associated with a favorable zone or belt of strata from 60 to 100 feet in thickness, consisting of black slates beneath basalt. Slipping along these black slates has given rise to laminated quartz lodes varying in thickness

from a few inches to many feet, and usually of greater size along the anticlines and synclines. These beds have been traced for over two miles along their strike north-west and south-east. An interesting feature is that only west-dipping beds have been found payable.

Mines have worked for many years on three parallel folds.

The Ballarat East Field has usually been regarded as an indicator field, yet the quantity of gold won from this type of lode is comparatively small when some of the other lode formations are considered.

Concisely, the indicator consists of beds, usually of slate, which influence auriferous concentration at their intersection with quartz veins and spurs. A typical example is "the Indicator," a narrow slate bed characterized by much pyrites, which, where it has intersected certain quartz veins, has yielded lumps of gold weighing as much as 400 ozs. Its bedded nature is apparent in the Woah Hawp Canton Mine, where it is seen in section on either side of a syncline, and repeated again on the far side of an anticline.



GOLD-MINING.

The most important lode structure is, however, that associated with the "Leather Jacket" fault, which trends with the strike of the beds and dips west at about 45° . Where these faults intersect the east-dipping strata the shattered beds have induced the formation of auriferous quartz spurs where the favorable beds are intersected. In contrast to the Ballarat West Field, only east-dipping strata are favorable.

Of the other lode formation, spurs and ore bodies associated with anticlines have yielded a considerable quantity of gold.

The mines of Ballarat East include the Britannia United, New Normanby, North Woah Hawp, New Kohinoor, Speedwell, and Victoria United, all of which have a history extending over considerable periods, and generally one of high yields.

In Ballarat West the Band and Albion Consols has yielded 158,299 ozs., and paid £252,001 in dividends, while the Star of the East has yielded 256,759 ozs., and paid £284,400 in dividends.

Excursion to Creswick, 16th August.—Motor cars will leave the City Hall in the morning.

The first six miles of the journey is over the basaltic sheet belonging to the same volcanic period as that observed on the railway journey from Melbourne.

Leaving Ballarat on the west side, the Ballarat West Gold-field is seen extending southward. Deep ground trending westward underlies this volcanic area, and the probable course of the leads here will be pointed out.

From Bunkers Hill, where certain high level gravels of early Tertiary age overlie the Ordovician bedrock, the trend of the ancient Divide, its location in respect to the present Divide, the position of the deep leads and their outlets, and interesting points concerning the physiography and vulcanism of the district will be indicated.

Just before entering the main road from Ballarat to Lake Burrumbeet is the probable junction of the Haddon with the main lead.

Lake Burrumbeet has been formed by the partial coalescence of lava flows from the surrounding vents, which will be pointed out. Sandy exposures on its shores have been caused by the prevalent wind causing breakers on a windward shore. The occurrence of stratified and bedded tuffs is interesting, and certain ejected blocks of granite are so large that they were originally thought to be outcrops.

Lake Learmonth, which is similar in origin and features to Lake Burrumbeet, is on the north side of the ancient Divide, and marks the probable position of one of the head tributaries of the Berry-Moolort-Loddon system, the most important in Victoria. At Ascot an English company erected a large plant for developing the main lead, and sank a shaft for 240 feet, but operations were suspended, and the pumps, which were capable of pumping 3,500,000 gallons per diem, were removed elsewhere.

At Creswick the Mayor and Councillors will receive the Visitors.—At Creswick denudation along anticlines has exposed yellow and grey sandstones and slates, with a consistent strike, and dipping east and west. The absence of good natural sections has to some extent precluded the examination of the field, and its structure is as yet imperfectly understood. The New Working Miner's mine has been working for some years on spurs, veins, and flat makes of quartz. The flanks of the Ordovician hills, notably those traversed by quartz reefs, are frequently capped by a layer of brown clay of Pliocene age, containing angular quartz pieces. In many localities gold is freely dispersed through this "wash," and extensive sluicing operations have laid bare large areas of the underlying Palaeozoic rocks.

There are fourteen well-defined points of eruption, and several smaller hills and depressions that might be considered as such in the Creswick district, a fact which gives some idea of the magnitude of volcanic activities in the past.

The Creswick and Spring Hill leads to the north have been wonderfully auriferous, and it is estimated that the group of mines, which worked these tributaries over a limited area, is responsible for an output of not less than 1,350,000 ozs. of gold, valued at over £5,500,000.

A large portion of the hill area on the road from Creswick to Ballarat is set aside as a forest reserve, and bears a natural eucalyptus forest, the timber being utilised chiefly for the district gold mines. With the exception of some tracts of rich volcanic land occupied for agriculture, this belt of forest continues in an easterly direction, and merges into Wombat forest—an extensive area of 130,000 acres.

At Creswick, pine plantations, covering an area of about 1,000 acres, have been established, the earliest plots being nearly twenty years old. Here some of the best timber-yielding conifers of Europe and North America are represented, such as the Corsican, Canary Island, Cluster, and Red Pine, and the Douglas Fir, Pitch Pine, Japanese Red Pine, and Monterey Pine. A large tree nursery, where upwards of 4,000,000 plants are raised annually, is laid out in a sheltered valley, in the midst of these plantations.

In the vicinity there is a forest school, with accommodation for twenty students. The course of study and training extends over a period of three years, and, in addition to practical and theoretical forestry, subjects naturally allied to forestry, such as botany, geology, chemistry, mathematics, and surveying, are taught. Practical instruction is also given in the general work of the State nursery and plantations.

Returning *via* Dean, a panoramic view of the volcanic area to the north, as well as over the eastern plateau near Ballarat, will be obtained from the Main Divide, and, if time permits, the Ballarat Water Reserve with its plantations of pine will be inspected.

Return to Melbourne, 17th August, by morning train.

EXCURSION TO BENDIGO AND DISTRICT.—SATURDAY, 15TH, TO MONDAY, 17TH AUGUST, 1914.

Leader—Mr. H. Herman, B.C.E., M.M.E., F.G.S., Director of Geological Survey.

PROGRAMME (Times of trains to be arranged).

The Railway Journey.—The Bendigo train starts from the Spencer-street station.

The railway passes through country which exhibits striking contrasts in appearance and structure.

West Melbourne is built on the eastern edge of an older Tertiary volcanic flow, one of a series ranging in age, perhaps, to Holocene, which extends for about 176 miles westerly, and covers an area of more than 8,000 miles, occupying the western portion of a valley termed by Gregory "the Great Valley of Victoria."

The first 40 miles of the journey is almost entirely over these volcanic deposits which form grassy plains, largely treeless, usually of good soil, while the remainder is mostly over Ordovician rocks of sedimentary origin, yielding poor soil and timber, except in the valleys, which have in many cases been riddled with shafts, and rendered unfit for cultivation.

Between North Melbourne (1 mile, height 18 feet), where there is an example of concentric weathering of basalt in a cutting on the right side of the line, and Footscray, is the valley of the Saltwater River. In the southern distance to the west and east respectively are the ports of

Williamstown and Port Melbourne, on the shores of Hobson's Bay. Flemington Race-course, on the north side of the railway, owes its unique position to the gorge formed by the erosion of the basalt, which forms on either side of a level flood plain a natural amphitheatre.

As far as Sunbury (23 miles, height 702 feet) the undulating country on either side of the railway is generally adapted to cereal crops, and has of late years been made more available for the small farmer by the subdivision of large estates.

An outcrop of Ordovician rocks at Sunbury is interesting, as it shows the extension under the basalt of beds which are more fully represented in the north.

The rise at Sunbury (height 702 feet) from the Melbourne basin to the basaltic plateau (the extension eastward of the Ballarat Plateau) is evidenced by the height of Lancefield Junction (31 miles, 1,071 feet), an ascent of 369 feet in $7\frac{1}{2}$ miles.

For the next 17 miles nearly all the hills on the left side of the railway are scoria cones. The rapid ascent to the Main Divide from Lancefield Junction is apparent by an inspection of the heights at Riddell (35 miles), 1,205 feet; Gisborne (40 miles), 1,526 feet; Macedon (43 miles), 1,660 feet; and Woodend (48 miles), 1,840 feet, the last-named being situated on the northern fall.

The Lower Ordovician beds that outcrop about two miles north of Gisborne belong probably to the Darriwil series. Mt. Macedon (3,324 feet), composed of dacite, granodiorite, and a series of alkaline volcanic rocks, is conspicuous on the right of the line between Macedon and Woodend, and marks the position of the Main Divide, which here trends north-east and south-west, the northern streams flowing to the Murray and the southern to Bass Straits and the Southern Ocean.

The quarry about three miles north of Macedon, on the left of the line, is limburgite. Beyond Woodend, the Hanging Rock or Mt. Diogenes, a weathered plug of solvsbergite, is visible about four miles to the right. The type locality of the lately erected rock species woodendite, an alkaline basalt with a high percentage (1·23 per cent.) of phosphoric acid, is a short distance from the railway. The district around Macedon and Woodend has been the subject of much petrological research.

From the Campaspe, about seven miles above Woodend, the basalt extends as far as Malmsbury, covering the Coliban-Campaspe lead, which has in places been payably worked.

At Kyneton Station (57 miles, 1,687 feet) there will be a stay of twenty minutes for breakfast.

The reservoir at Malmsbury (63 miles, 1,492 feet) to be seen on the left of the railway, supplies Chewton, Castlemaine, Bendigo, Eaglehawk, and other localities with water for domestic, manufacturing, and mining purposes. It has a capacity of 3,337 millions of gallons, and, with another reservoir some miles to the south, maintains a total storage of 7,437 millions of gallons.

Mining has assumed in the past an important aspect at Malmsbury and Taradale (67 miles, 1,338 feet), but these fields are now neglected. The saddle-reef field of Lauriston is a few miles south of Malmsbury. The Malmsbury alluvial (deep lead) mine is immediately to the right of the railway, just beyond Malmsbury Railway Station.

Elphinstone (70 miles, 1,365 feet) is situated at the southernmost end of an area of over 100 square miles of granite. The railway emerges from the Elphinstone tunnel on to the Chewton-Castlemaine Gold-field, containing mines over 1,000 feet deep. This was a rich alluvial field 60 years ago. The lodes are big stockworks, associated with faults and saddle reefs. The railway runs through this gold-field to Castlemaine (78 miles, 919 feet), with a population of about 7,000. It has woollen mills, and one of the largest private engineering works in Australia. The Ordovician slates here belong to at least two series, the Bendigo and Castlemaine, Dr. T. S. Hall having selected his type locality for the latter in this district.

At Harcourt (82 miles, 1,096 feet) the railway re-enters the same granodiorite area as was passed at Elphinstone. The Harcourt soil is eminently adaptable to fruit culture, and many of the largest orchards of the State are here. Granodiorite is quarried as a building stone, and is represented in the Central Railway Station and the Equitable Buildings, Melbourne.

About five miles after passing Ravenswood (90 miles, 979 feet) the line passes through a tunnel on to the Lower Ordovician sediments, altered at the contact with the granodiorite, through Kangaroo Flat (97 miles, 841 feet) and Golden Square to Bendigo (758 feet), 101 miles from Melbourne.

Reception by the Mayor and Councillors of the City of Bendigo, and inspection of the features of the City.

Lunch.

Inspection of Mines and Geology of Bendigo.

Some Facts concerning Bendigo.—The spot on which the City of Bendigo now stands was, previous to the discovery of gold in 1851, a sheep run. That great impetus to colonization, mineral wealth, soon changed the face of nature and in a few months the scene was one of activity and industry. In 1853 the banks purchased 661,749 ozs., which, with the additional quantity taken away privately, makes the value in that year about £3,000,000.

The source of this alluvial wealth next invited the attention of the thoughtful miner. Proof of the existence of reefs or lodes of payable size and extent paved the way for permanent settlement, and in 1854 Bendigo was surveyed and systematically set out. A municipal boundary was fixed in 1855, and a few months later the first council was elected. Streets were properly formed, areas for gardens set aside, and every advantage taken of natural surroundings to improve their aspect. In 1857 the first Circuit Court was held, and in 1858 tenders were let for the construction of a railway to Melbourne. A census was taken in 1858, and gave the population as 28,928. Bendigo was proclaimed a borough in 1863, and a city in 1871.

The area of the City of Bendigo is 7,900 acres, and the population about 40,000. Bendigo division returns one representative to the Federal and four representatives to the State Parliaments. Eaglehawk, three miles to the north, and essentially a suburb of Bendigo, is a separate municipality.

The public buildings include the City Hall, Post Office, Savings Bank, Sub-Treasury, Law Courts, Hospital, Benevolent Asylum, State and Private Schools, School of Mines, Mechanics' Institute and Libraries, several Banks.

Theatres, Churches, several Halls, and others. There are six recreation reserves, the Botanical Gardens being replete with many choice shrubs. The Art Gallery contains pictures representing early Bendigo history and several continental schools.

The climate is equable.

Gold-mining is, of course, the chief industry; but there are iron foundries, potteries, granite cutting and polishing yards, tanneries, brick and tar works, breweries, distilleries, cordial, jam, bacon and fuse factories. Railway workshops have also been established.

Land surrounding Bendigo is suited to viticulture and orchards; considerable development has been attained in these directions. Tomatoes have been cultivated with marked success, the climate making it possible to market them early in the season. Bendigo is a junction railway station, several lines deviating from it.

The Gold-fields of Bendigo.—The characteristic lode of the Bendigo Gold-field, locally termed a "saddle-reef," conforms to the apex and sides of an anticline. In cross-section, the top of the saddle is termed the "cap," and, looking north, the right and left sides the east and west "legs" respectively. The beds about the axial plane are termed "centre country," and as this plane dips eastward, the centre country is said to dip east. In longitudinal section the saddle-reef has a persistent extension in strike known as a "line" of reef. The inclination of a line from the horizontal is known as "pitch." That point from which the line of reef pitches in two directions is termed a "dome," which is usually regarded as a good site for operations.

Mining has been carried on along some of these lines over a length of 20 miles. The saddles recur in depth, as many as 24 in 2,200 feet having been passed through. The latent possibilities of this field can therefore be well imagined. The cap is often from 20 to 50 feet across, and from 20 to 30 feet high, with, at times, a narrow upward prolongation of 100 feet or more. The legs are seldom more than 3 or 4 feet across, and taper to a point at 100 feet or less from the axial plane, after which slickensides or fault striations mark the line of movement of the superimposed beds, suggesting the fault nature of the lodes.

The monchiquite dykes or "lava streaks" are remarkable for the persistence with which they have pushed their way through the axial lines to the surface. They are probably of Tertiary age.

The profusion of graptolites in the multicoloured slates and silts gives a general idea of the conditions of sedimentation, which occurred in tranquil water some distance from a shore line; the presence of sandstones and coarser beds, however, evidences oscillations in level.

Economically, there are three main lines, Hustler's, Garden Gully, and New Chum. Mining has been carried on along these lines to a greater extent than along the adjoining ones, and many of the mines have been wonderfully productive.

The Lightning Hill, Millers, Derby, Paddy's Gully, Deborah, Sheephead, Nell Gwynne, British and Foreign, Napoleon, Carshalton, Thistle, Christmas, and Lancashire lines are usually termed side lines. They have been prospected and worked to a lesser degree.

The area of the gold-field proper is 45 square miles -15 miles long by 3 miles wide. The yield from 1850 is about 20,000,000 oz., valued at £80,000,000. The yield for 1913 was 168,172 oz. During 1913, seventeen mines paid dividends to a total amount of £133,712, chief among which were the Central Red White and Blue Co., £38,400; Golden Pyke Co., £23,442; and Carlisle Co., £12,550.

Some notable dividends in the past include the Garden Gully United Co., £852,169; Great Extended Hustler's, £463,000; Johnson's Reef, £328,420; South New Moon, £504,600; New Moon, £370,128.

Mining has been carried on at a depth of 4,614 feet at the Victoria Reef Quartz Mine, which is the deepest gold mine in the world. Thirteen mines are over 3,000 feet, and 53 over 2,000 in depth.



BENDIGO GOLD MINE—4,294 FEET LEVEL.

A conversazione will be held in the evening.

Excursion to Newbridge and Laanecoorie, 16th August.—Motor cars leave the Post-office in the morning. The road to Marong crosses the Bendigo municipal boundary to the north of Specimen Hill. The Lower Ordovician beds here are well down in the Bendigo series, and have the same average strike as the rest of the beds at Bendigo. This consistent strike and the recurrence of certain beds along the denuded folds is a significant feature of Victorian geology.

The road passes the Eaglehawk aqueduct—a part of the Malmsbury scheme observed on the railway journey—continues over Ordovician sediments, and eventually along an alluvial valley, a head tributary of a part of the Berry-Moolort-Loddon deep lead system. It then crosses that tributary, and enters the township of Marong.

On an isolated area of Ordovician, surrounded by alluvial deposits, is the Wilson's Hill Gold-field. This gold-field has many characteristics in common with Bendigo, and is interesting as showing a repetition of Bendigo

conditions to the west of that gold-field. Along the axial lines, namely Wilson's, Albion and Gray's, both saddle and inverted saddle reefs have been worked with variable results.

The Tertiary tributaries of Marong have their origin at Lockwood and Shelbourne. They have been worked profitably by the Marong alluvial and other companies, some of which worked ground which yielded as much as one oz. per load. Bendigo zone graptolites were found in the cores of some bores put down to locate a lead.

From Marong the road crosses Spring Creek, another outcrop of Ordovician beds, and enters at Woodstock the valley of the Loddon River, which rises in the Great Divide and flows into the Murray.

At Woodstock a narrow strip of basalt, which joins the Berry-Moolort basalt area on the south to the Tarnagulla area on the north, overlies the Berry-Moolort-Loddon main trunk lead, proved by bores to exist at depths of 338 feet and 298 feet at localities north of the road. This lead, with all its large and rich tributaries, ranks as the best gold producing lead in Victoria.

The Loddon River will be reached at Newbridge township (24 miles). Thence the journey for six miles up the Loddon on the west side will be across various alluvial leads, mostly shallow, the scene of several "rushes" during the past fifteen years. The Poseidon Field, the deep ground of which is being gradually developed, is midway between Newbridge and Laanecoorie, and large nuggets (up to nearly 1,000 ozs.) are occasionally found here. Glacial conglomerate, probably Permo-Carboniferous, occurs in the Loddon Valley under the basalt, at the surface at Newbridge and at intervals for many miles to the south. It will be inspected at Poseidon.

Laanecoorie (30 miles) will next be reached. Lunch will be at the weir, close to the township.

The total length of the Laanecoorie Weir is 1,020 feet, and the water impounded by the reservoir extends some $5\frac{1}{2}$ miles up the river valley. The available contents to the top of the gates is 610 million cubic feet. The total cost of the work was £136,674.

The weir is part of the system of irrigation which waters the northern plains, and which has proved the value of land hitherto regarded as unfit for close cultivation.

Westward of Laanecoorie there is a decided change in the stratigraphical position of the Ordovician sediments. They belong, as far as is known, to the Lancefield series. They have been highly auriferous, and are responsible for a great percentage of the nuggets for which Victoria is so noted.

The road from Laanecoorie to Shelbourne recrosses the Loddon Valley, and about 10 miles from the former place enters the Harcourt granodiorite area. That this granodiorite is Post-Ordovician is evident from the altered state of the Ordovician at the contact, and it is noticed that the folding has in no wise been disturbed.

At Kangaroo Flat the southern extension of the Bendigo western axial lines is met. A run thence of about $3\frac{1}{2}$ miles into Bendigo is close to Bendigo Creek (on the left), one of the most famous old alluvial diggings

of the world. Just beyond Golden Square (1½ miles from Bendigo) the poppet heads on the right are those of the Shenandoah Mine, on the left, those of the Shamrock. Going south from the Shenandoah, the successive shafts are New Chum Railway (4,318 feet deep), Eureka, and South Belle Vue.

Going north from the Shamrock numerous shafts are passed, including the New Chum Consolidated (3,099 feet deep), Lansell's 222, Lansell's 180 (3,365 feet), Lazarus (3,682 feet), Victoria Quartz (4,614 feet), &c. The series of gold-mining shafts for about a mile in length of the New Chum line of reef constitute probably the deepest in the world.

Nearing Bendigo, the freestone building on the left is the Roman Catholic Cathedral.

There is little of interest from a forestry point of view on the journey, saplings only marking the regrowth of timber, more than once cut for fuel and mine supply. Between Lockwood and Kangaroo Flat are small areas of young pole forest on either side of the road, of red and white ironbark and grey box; these are worked on the coppice system for the production of fuel and props for the Bendigo mines.

During the journey, stops will be made at a few favorable points to explain the features of the district.

17th August.—Leave Bendigo by morning train.

WEEK-END EXCURSION TO THE NATIONAL PARK—WILSON'S PROMONTORY.—FRIDAY (MIDNIGHT)—MONDAY, 14TH—17TH AUGUST, 1914.

Leader—*Mr. C. Catani, Chief Engineer, Public Works Department.*

PROGRAMME.

The *Lady Loch* will be berthed at Port Melbourne on Friday afternoon, 14th August. The visitors should send their luggage during the day, and board her as soon as convenient, after the reception, which is to be held that night. The *Lady Loch* has comfortable accommodation for twelve guests. A start will be made about midnight on Friday.

The party will reach the western slopes of the Promontory by midday on Saturday. The Glennie Islands and the adjacent bays will be inspected and, weather permitting, a landing for a short time may be effected, but probably it will be better to push on and land at the lighthouse. The Anser Group will be circumnavigated and the party landed with comfort at the lighthouse. According to the time available, small excursions near the lighthouse will be arranged for, and the members will then return on board, and the characteristic bays and peaks of the eastern slope will attract attention. The boat will retire for shelter into Sealer's Cove or thereabouts, weather permitting, on Saturday night.

On 16th August, after an early breakfast the visitors will land at the jetty at Sealer's Cove. A sufficient number of saddle horses will be provided, and a start made for the Committee's Quarters on the Derby

River, where dinner will be partaken of. In the afternoon the party, again mounted, will ride to the jetty in Corner Inlet, but, if time permits, the ascent of a peak about 1,600 feet high will be made, from which a commanding view of the Inlet can be had.

On arrival at the jetty the Committee's launch will be met, and the *Lady Loch* will be boarded at Seaforth. The return journey will then be commenced, and the vessel will arrive at Melbourne on Monday morning. If it should be desired, on the Monday morning a landing could be effected either at Sorrento or Queenscliff, and the party could reach Melbourne in time for the meeting on the Monday afternoon.

For the information of the visitors I attach a few notes on the flora and geology of the National Park, kindly prepared by Professor Ewart and Dr. Hall, who are members of the Park Committee.

THE FLORA.

By Alfred J. Ewart.

The flora of the National Park is one of great interest, variety, and abundance. It includes over 600 species of flowering plants and ferns, and contains a less proportion of aliens than any other part of Victoria of similar extent. Heath, mountain, swamp, and sand dune flora are all well represented, but unfortunately the fires which swept the Promontory prior to the appointment of the Park Committee destroyed much fine timber, and with it many of the rarer plants to be found on the higher mountain tops. The resulting thick undergrowth consists of a relatively smaller number of a distinct species and is in many parts so thick as to be impenetrable.

In the open parts various heaths are to be seen (*Epaeris*, &c.), but the red flowers of *Tetratheca*, the green or red ones of *Correa*, and the purple ones of *Comesperma* usually appear later in the year. Orchids are abundant throughout the Park in moist places, and its shores give the most southerly locality for any Mangrove vegetation (*Ariceumia officinalis*). Among the trees the Beech (*Fagus Cunninghamii*) is of special interest, and occurs only on some of the higher ranges. Eucalyptus and Acacias are well represented. The shores around the base of the Vereker Range are clothed with a fine forest of Banksia, interspersed with the so-called Grass-tree (*Xanthorrhoea*). In some cases the National Park represents the only locality on which certain native plants grow. This applies to *Fieldia Australis*, *Xanthosia tridentata*, and the fern *Lindsaya trichomanoides*; many other rare species occur within the precincts of the Park.

GEOLOGY.

By Dr. Hall.

Wilson's Promontory, so aptly termed by Flinders the cornerstone of the continent, is like the great line of islands stretching from it to Tasmania, a mass of granite. Drifting sand has tied it to the mainland by a narrow neck. Corner Basin, or as it is now called, by an improper transference

of names. Corner Inlet, is a shallow bay intersected by a few deeper channels radiating from its mouth. A very large part is dry at low tide, and it is gradually filling with the alluvium of the streams entering it from the north.

Freshwater jurassics and marine silurian form the adjacent mainland, and a platform of red tertiary sandstone forms the proximal portion of the isthmus. Further south the neck consists of sand dunes sometimes well grassed, but for the most part bare and drifting.

The main mass of the Promontory is formed of granite hills rising to a height, in places, of 2,400 feet, and carved into deep valleys. The granite is coarse grained and contains large crystals of orthoclase. In places basic inclusions are common, and stand out on weathering, so that the rock looks like a conglomerate. Black tourmaline is common, and a little cassiterite has been found. Wherever valleys run down to the sea they are banked up by drift sand, a feature more marked on the western or weather side. The landward march of the dunes up the valley has interfered with the drainage, and swampy conditions prevail on each side of a dry central strip, and a small stream usually enters the sea from the swamps.

The Derby River is formed by the drainage from the Western slopes of the Vereker Range, which is dammed back by the dunes so as to form a large marsh, from which the waters escape to the sea under the lee of a protecting granite bluff.

EXCURSION TO CENTRAL RESEARCH FARM, WERRIBEE.—
SATURDAY, 15TH AUGUST, 1914.

Leader—Dr. S. S. Cameron, Director of Agriculture.

PROGRAMME (Times of trains to be arranged).

Vehicles will await the members of the party at Werribee to drive them round the farm. Afternoon tea will be served in the open air.

NOTES ON EXCURSION TO CENTRAL RESEARCH FARM, WERRIBEE.

This Farm was established in 1912 to provide for permanent use by the Department of Agriculture a farm on which to carry out research work, experiments, and practical demonstrations in agriculture and live-stock husbandry.

The operations reflect the teachings and experience of the staff of the Department, and are designed in their results to promote sound and advanced agricultural practice suitable to the present and probable future circumstances of the State.

Investigations and trials under practical and accurately-recorded conditions have been commenced concerning the problems involved in increasing the agricultural output of the State, particularly as regards—

- (a) Improvement of wheat and other cereals, grasses, and economic plants by selection, stud-breeding, and hybridizing;
- (b) Soil renovation, fertilizing, and tillage methods;
- (c) Rotation of crops and improved cropping practices;
- (d) Irrigation practices; drainage and aeration of soils;

- (e) Improvement of natural pastures, and trials of artificial grassing with exotic and native grasses;
- (f) The breeding and feeding of live stock, improvement of milk yields, production of standard export types of lambs;
- (g) Research concerning soil moisture, temperatures, biological conditions, and nitrification processes; and the nutrition of plants;
- (h) Meteorological observations relating to agriculture.

A guide book will be handed to visitors, which will detail the principal experiment work undertaken so far, as under :—

I.—DRY FARMING.

Permanent Rotation Field.

Cereal Experiment Fields—

- (a) Stud Cereal Selection and Cross-bred Plots, Pot Experiments, and Meteorological Observations.
- (b) Permanent Fertilizer Plots.
- (c) Barley Variety Plots.
- (d) Select-bred Wheat Plots.
- (e) Green Manurial and Feeding-off Tests.

Grass Seeding Trial.

Top-dressing Natural Pasture.

Legumes for Soil Renovation.

Top-dressing Cereals with Nitrates.

Bulk Wheats for Seed.

II.—IRRIGATION.

Lucerne Field—

- (a) Top-dressing of Lucerne, 1914.
- (b) Soil Inoculation Trials, 1913.
- (c) Fertilizer Trials, 1913.
- (d) Rate of Seeding Trials, 1913.
- (e) Lucerne Varieties, 1912.
- (f) Rate of Liming, 1912.
- (g) Inoculation and Liming Trials, 1912.

Seeded Pasture.

Lucerne.

Clovers.

III.—LIVE STOCK.

Sheep—

Cross-breeding for Export Lambs.

Stud of Suffolk-downs.

Cattle—

Red polled Dairy Herd.

Feeding Experiments.

Dairy Methods and Milk Hygiene.

EXCURSION TO IRRIGATED AREA AT BACCHUS MARSH.—
SATURDAY, 15TH AUGUST, 1914.

Leader—Elwood Mead, M.S., Dr. Engineering.

PROGRAMME (Times to be arranged).

It is proposed that the members be taken in motor cars from Melbourne to Bacchus Marsh, and thence to Pyke's Creek Reservoir, where they will have lunch in the open air. On the return journey they will spend two hours at Bacchus Marsh, and will be shown the irrigation and cultivation in and around the district.



OTHER PLACES OF INTEREST.

Of the places of interest in the State which have special attractions for the ordinary tourist the following may be mentioned :—

Mount Buffalo.—This mountain is a bold irregularly-shaped granitic mass situated in the north-east of Victoria, and rising abruptly to a height of about 5,700 feet above sea-level. From the top is obtained a magnificent view of the mountain peaks of the Great Dividing Range and its offshoots rising above the lower hills on three sides and visible in one direction to a distance of nearly 100 miles. A chalet, which has been erected by the Government a few miles from the summit, at an altitude of about 4,500 feet, has superior accommodation for visitors, of whom it receives a large number each year. The mountain is about 200 miles distant from Melbourne, from which it is reached by train and coach. The minimum time which would be occupied



LAKE CATANI, MOUNT BUFFALO.

by a trip, including the journey both ways, would be about three days. In the months of July and August the ground surrounding the chalet is always covered with snow, and Lake Catani, 60 acres in extent, lying on the plateau, is frozen over to a depth of eight inches at midwinter.

A view from the Gorge, near which the chalet is situated, appears in this handbook.

The Gippsland Lakes.—These lakes—four in number—are in the south-east of the State, close to the coast, and are formed by the debouchment of the Latrobe, Mitchell, Nicholson, and Tambo Rivers into Bass Strait. They are reached by steamer from Bairnsdale after a train journey of 171 miles from Melbourne.

Buchan Caves.—These were only recently made accessible to visitors, and are reached from Bairnsdale by a coach journey of 47 miles. They contain limestone deposits consisting of stalactites and stalagmites in weirdly beautiful shapes.

A trip from Melbourne to either the Gippsland Lakes or the Buchan Caves would occupy about three days.



FAIRY CAVE, BUCHAN.

Daylesford.—This is a town with an approximate population of 3,850 situated about 76 miles to the north-west of Melbourne. It is reached from that city by train, the first portion of the journey—49 miles—being on the main Bendigo line, and the second portion—27 miles—on a branch line from Woodend.

It is noted chiefly on account of the existence of mineral springs at Hepburn—two miles distant—which draw large numbers of visitors from other portions of the State as well as from neighbouring States, and on account of there being a number of important quartz reefs in the vicinity.

The surrounding country is mountainous—Mount Franklin, a volcanic cone (2,092 feet), being a prominent feature of the landscape.

Lorne.—This is probably the most popular watering place in the State with persons in easy circumstances. It is distant from Melbourne about 105 miles, the route being by train to Dean Marsh *via* Birregurra (91 miles), and thence by coach to the destination (14 miles). The popularity of Lorne is due chiefly to its combination of mountain, river, and coastal scenery.

A trip from Melbourne which would enable a visitor to see anything of the surrounding country would occupy at least three days.

Sorrento.—Of the many seaside places in the neighbourhood of Melbourne which are frequented by visitors few, if any, are better known than Sorrento. It is situated near Port Phillip Heads, about 40 miles south of Melbourne, from which it is reached in summer by steamer. In winter the usual route is by train to Mornington (39 miles) and thence by coach (29 miles).

There are many mountain and seaside resorts in the State in addition to those enumerated above, but those which have been mentioned are probably the ones which attract the largest numbers of visitors. Of the places of interest in Melbourne, the Botanic Gardens, the Zoological Gardens, the Public Library, the National Gallery, and the National Museum deserve special notice. The three last-mentioned institutions are described in an article which appears elsewhere in this handbook.



THE PROBLEMS IN THE STATE OF VICTORIA WHICH AWAIT SCIENTIFIC SOLUTION.

By James W. Barrett, C.M.G., M.D., M.S., F.R.C.S., Eng.

The Committee intrusted with the preparation of this handbook for the use of members of the British Association have asked me to write a general introduction to the problems set out in its pages, which are discussed by a number of specialists.

They have suggested that the introduction should take the form of a sketch indicating the practical problems in the State of Victoria which await scientific solution. It is difficult to a degree to deal adequately with so vast a field. It is difficult to limit the consideration of problems to the State of Victoria, inasmuch as the adjoining portions of the neighbouring States of South Australia and New South Wales do not differ in any natural features from parts of the State of Victoria. The boundaries are political. It is also difficult to separate a problem of world-wide interest from one of merely local interest. I have, however, endeavoured to observe a separation as far as it can reasonably be attempted, and, where it has been necessary to deal with problems affecting Australia as a whole, or with local phases of world problems, I have tried to indicate the special reasons for undertaking the more comprehensive survey.

Furthermore, as the majority of the problems to which I shall refer are set out in greater detail by the several writers who have undertaken to deal with special divisions of knowledge, I have endeavoured to present the introduction in the form of an expanded index ;—the nature of the difficulties being indicated at sufficient length to stimulate, I hope, reference to the more extended sources of information.

In order to obtain information, I wrote to the following gentlemen, who very kindly replied setting out the problems as they appeared to them. Their answers are incorporated in the statement which follows :—

Professor R. J. A. Berry, Anatomical Department, University of Melbourne.

P. Baracchi, Esq., Government Astronomer.

Dr. Cameron, Director of Agriculture.

W. Calder, Esq., Chairman, Roads Board.

W. A. Callaway, Esq., Under Secretary.

J. P. Carolin, Esq., formerly Mayor of Bendigo.

Professor Ewart, Botanical Department, University of Melbourne.

J. J. Falconer, Esq., Australian Mercantile, Land, and Finance Co. Ltd.

M. P. Hansen, Esq., Education Department.

H. Herman, Esq., B.C.E., M.M.E., Director of Geological Survey, State of Victoria.

Dr. T. S. Hall, Biological School, University of Melbourne.

G. H. Knibbs, Esq., C.M.G., Commonwealth Statistician.

A. M. Laughton, Esq., Victorian Government Statist.

Dr. J. A. Leach, Education Department.

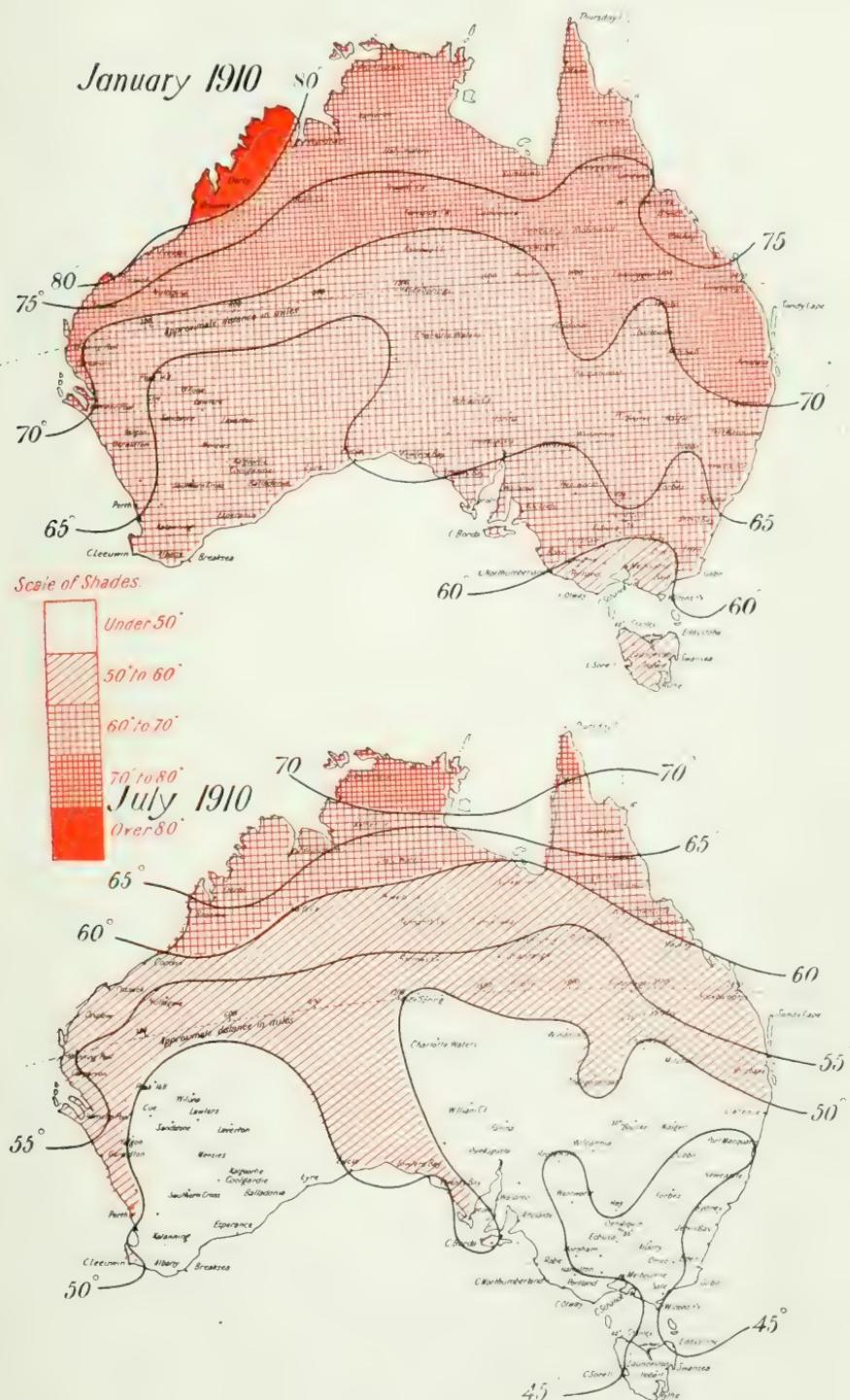
Professor Lyle, Department of Physics, University of Melbourne.
F. E. Lee, Esq., Closer Settlement Board.
H. R. Mackay, Esq., Conservator of Forests.
Dr. Elwood Mead, Director of Irrigation.
Colonel Monash, M.C.E.
H. M. Murphy, Esq., Chief Inspector of Factories.
Professor Masson, Chemical Department, University of Melbourne.
Dr. Matheson, Pathological Department, Melbourne Hospital.
Professor Osborne, Physiological Department, University of Melbourne.
Professor Payne, Engineering Department, University of Melbourne.
Professor Skeats, Geological Department, University of Melbourne.
Dr. Harvey Sutton, Education Department.
F. Tate, Esq., M.A., I.S.O., Director of Education.
H. L. Wilkinson, Esq., M.C.E.

Geographical and Climatic.

One of the most common of the erroneous impressions which exists in Europe is that Australia as a whole, and Victoria as a part of it, is a hot country, and that much of it is tropical in character. The impression has arisen from a number of circumstances. A considerable portion of Australia lies within the Tropic of Capricorn, and Melbourne, the most southern city in Australia, lies in latitude 39° south. Furthermore, for the most part climatologists have measured climate by dry-bulb temperatures, which are, from the physiological point of view, not only comparatively useless, but decidedly misleading.

Since J. S. Haldane, in the *Journal of Hygiene* (1905) showed us that human climatic stresses are to be measured by the wet-bulb thermometer only, physiologists have regarded the problem of residence in tropical climates from a new point of view. Haldane showed that at or about a temperature of 90° F. wet bulb all forms of physical activity must cease, otherwise the temperature of the body rises and heat apoplexy makes its appearance. The temperature may be a little below or above 90° , according as the air is still or in motion, and according to the extent to which the body is denuded of clothing. Haldane further showed that it did not matter how this wet-bulb temperature was produced. It might be produced by conditions in which the dry and wet bulb both read 90° F., or in which the dry bulb was 130° , with a low degree of moisture in the atmosphere, and a wet bulb register of 90° F. But whatever combinations of moisture and temperature existed, all that the physiologist is concerned with is the registration of the wet bulb thermometer. He further showed that at a temperature exceeding 78° F. wet bulb active physical work was difficult to perform.

Professor Osborne, of the Melbourne University, and the writer suggested to Mr. Hunt, the Commonwealth Meteorologist, that he should plot the whole of Australia in wet-bulb isotherms, so that a knowledge of the conditions would be available. The following charts show the wet-bulb isotherms in Australia for January (midsummer) and July (midwinter):—



It will be noted that at midwinter, practically the whole of the continent is below 70° F. wet bulb, and in midsummer, the greater part of the continent is below 75° F. wet bulb. As in no other country in the world have similar wet-bulb isotherms been plotted for a continent for a considerable period of time, it is impossible to make the comparisons that might be desired. The following wet-bulb temperatures of New York, Chicago, and London give, however, some indication of the relative severity of a summer in Victoria, in the United States, and in Great Britain.

Harrington worked out the wet-bulb isotherms for the United States for the month of July about 1896. Since that time apparently no comprehensive work has been done until the work which Mr. Hunt has completed.

MEAN WET BULB TEMPERATURES DURING SUMMER MONTHS—JUNE, JULY, AND AUGUST.

London	..	..	..	56°, mean hourly.
New York	..	..	..	67·6 (8 a.m.)
Chicago	..	..	..	65·2)

The absolute maximum in Central Park, New York, between May and September is invariably 80°, and in July 83°.

ELEMENT—WET-BULB TEMPERATURES (9 A.M.).

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
<i>Ballarat.</i>													
1908 ..	60·7	57·2	55·0	51·1	46·0	39·9	40·9	41·2	43·5	49·7	56·5	56·6	49·9
1909 ..	55·6	55·6	54·8	47·0	46·1	43·6	40·7	43·0	45·3	49·5	50·8	51·9	48·7
1910 ..	59·4	58·4	56·5	51·4	47·4	44·2	42·6	44·6	47·2	47·0	54·3	52·9	50·5
1911 ..	57·5	59·2	55·3	48·5	47·2	41·6	39·8	45·1	47·2	48·0	53·4	52·6	49·6
1912 ..	54·4	57·5	55·3	48·8	44·4	43·2	39·9	42·3	44·8	49·0	51·3	53·6	48·7
Means	57·5	57·6	55·4	49·4	46·2	42·5	40·8	43·2	45·6	48·6	53·2	53·5	49·5

Bendigo.

1908 ..	62·4	60·8	53·6	51·7	46·6	40·9	42·0	42·7	45·1	50·9	56·5	57·3	50·9
1909 ..	57·6	55·2	55·9	47·4	46·1	44·3	41·7	43·7	47·1	50·0	52·2	53·2	49·5
1910 ..	60·8	59·3	56·6	51·7	48·7	45·0	43·3	45·0	49·0	48·2	55·1	54·4	51·4
1911 ..	59·1	60·5	56·2	49·1	47·9	41·6	40·7	45·7	48·6	49·4	55·1	53·9	50·6
1912 ..	56·1	60·3	56·6	49·5	45·0	44·5	41·9	44·5	45·8	49·5	52·9	56·3	50·2
Means	59·2	59·2	55·8	49·9	46·9	43·3	41·9	44·3	47·1	49·6	54·4	55·0	50·5

Melbourne.

1908 ..	64·6	61·2	56·0	53·0	48·1	43·3	43·6	44·2	47·6	52·0	56·6	57·2	52·3
1909 ..	58·2	58·2	57·4	47·8	48·7	46·1	43·0	45·5	48·8	52·2	53·9	54·7	51·2
1910 ..	60·4	59·7	58·1	53·3	50·5	46·8	44·7	47·4	50·6	50·1	56·5	54·5	52·7
1911 ..	59·6	61·6	58·7	51·3	50·8	45·0	42·3	48·6	51·1	52·0	56·3	55·6	52·7
1912 ..	57·4	61·8	58·5	53·0	47·1	46·2	43·2	46·9	49·1	52·0	54·4	56·3	52·2
Means	60·0	60·5	57·7	51·7	49·0	45·5	43·4	46·6	49·4	51·7	55·5	55·7	52·2

ELEMENT—WET-BULB TEMPERATURES (9 A.M.)—*continued.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
<i>Mildura.</i>													
1908 ..	68·7	63·6	57·5	52·1	40·8	38·7	39·8	42·5	46·4	54·1	58·9	60·9	52·0
1909 ..	58·4	59·7	57·3	46·0	45·7	44·5	40·1	45·0	47·9	52·9	54·9	55·3	50·6
1910 ..	62·0	60·4	58·4	53·3	51·2	47·6	45·1	47·0	50·7	51·8	56·9	56·0	53·4
1911 ..	60·4	61·8	58·3	52·0	50·0	42·5	42·5	47·4	50·6	51·7	61·4	60·7	53·3
1912 ..	61·5	64·4	61·2	51·8	47·6	45·0	41·8	47·5	48·8	54·4	57·0	59·6	53·4
Means	62·2	62·0	58·5	51·0	47·1	43·7	41·9	45·9	48·9	53·0	57·8	58·5	52·5

It will be noted that the effective heat in Ballarat and London is about the same, that Bendigo is a little warmer, and that Melbourne and Mildura, are still hotter.

Although in Melbourne the dry-bulb temperature has risen to over 110° in summer, and has reached a still higher level in parts of the country, the wet-bulb temperature has not exceeded, and has rarely approached, 75° in Melbourne itself. The foregoing statements explain the low death rate from sunstroke, not only in Victoria, but in the whole of Australia.

When the data are studied, readers will not be surprised at the fact that deaths from heat are not very common in Australia.

Using the International Classification, in 1911 the following deaths occurred :—

New South Wales	..	..	..	15
Victoria ..	..	..	..	14
Queensland ..	..	..	..	28
South Australia ..		..	..	7
Western Australia ..	..	..	..	12
Tasmania ..	..	..	..	2
Northern Territory ..	..	..	..	0
<hr/>				
Commonwealth (population 4,490,366)	..	..	78	
England and Wales (population 36,070,492)			541	
United States (registration area, population 50,000,000)	..	..	..	3,165

It will, therefore, be seen that heat is nearly as deadly in England and Wales as in Australia, and is far more deadly in the United States.

When, therefore, the climate is considered, the importance of providing properly constructed houses in the warmer parts of Australia is obvious. Recently Mr. Hunt has found that in kitchens at Port Darwin and

Townsville the wet-bulb temperature was several degrees higher than outside. If this is found to be a general condition, as it seems to be, it will explain the contrast between the robust appearance of the average man in Queensland, and the debilitated appearance of too many of the women.

The State of Victoria comprises an area of about 56 million acres, and extends between latitudes 34 and 39 south. It is characterized by many diverse climates, dependent on the elevation and the rainfall. Many visitors will be surprised to learn that portions of Victoria are under snow for some weeks during the winter months, and are practically impassable on this account. The maximum altitude of the mountains is 6,000 feet, and the rainfall varies from 11 inches in the north-west to 75 inches in some of the hilly country. As in other portions of Australia some of the country with a low rainfall is excellent for wheat, and the first and greatest problem which faces those who desire to see the State develop is to obviate the consequences of capricious rainfall. If the 11 inches of rain fell at the right time, and every year, it would probably be sufficient given suitable methods of farming; but a failure in point of time or during any one year means disaster. Hence it will not surprise the reader to learn that the first and greatest problem which confronts Victoria in common with the other States of the Commonwealth is the conservation of water and its utilization as a means of minimizing the effect of the unavoidable droughts. The mountain ranges, called the Grampians, the Victoria Range, and the Serras, which occupy the central north-west of Victoria, are the sources of the Wimmera and Avon Rivers which run to the north, the former into Lake Hindmarsh and the latter into Lake Buloke. It is in this catchment that water is being stored for the north-west region of low rainfall.

Furthermore, extensive irrigation works exist in the north-east and the north in connexion with the Goulburn River and tributaries of the Murray for the purpose of obviating the effects of drought in those districts, and of permitting closer settlement.

Periodic droughts must have existed in Australia for aeons of time. The fertile country around Lake Eyre, called by Professor Gregory "The Dead Heart of Australia," is subject to a capricious rainfall of 5 to 7 inches. It is described as being a desert when no rain falls; but, after a downpour of rain, insects and frogs make their appearance, grass grows, and for a few weeks the country smiles again. As the next dry period makes its appearance, the special mechanisms of the insects and frogs, and the special reproductive plant agencies, do their work, and the country again passes into slumber, awaiting the next rainfall. To any one possessing the least scientific imagination, it is clear that enormous periods of time must have passed before the fauna and flora of the country had adapted themselves to this mode of securing organic continuity. This extreme instance is illustrated in Victoria, and, indeed, in all other parts of Australia to lesser degrees. Nothing indeed is more striking to a visitor than the spectacle of a country which looks like a sand heap being turned into a fertile plain on the occurrence of the much-needed rains.

If the disasters which have overtaken Australia owing to droughts are to be avoided, investigations are wanted in at least three directions—

- (1) Accurate observations are necessary to show whether drought cycles can be predicted with certainty. Difficulty arises from the fact that the total rainfall for the year tells us very little. It is its seasonal incidence which is so important.
- (2) By the storage of the immense volumes of water which pass to the sea every year through the Murray and its tributaries, enormous quantities can be rendered available for irrigation. Such storage, however, immediately involves questions of economic efficiency and technical problems of the most harassing character, which are dealt with fully by Dr. Elwood Mead in the section on Irrigation.
- (3) Improved methods of farming enable the rainfall to be utilized to a far greater extent than formerly, and, if generally carried out, will do much to mitigate the effects of droughts.

Victoria has never been as seriously affected by droughts as other portions of Australia because of its diversity of climate, and because of the presence of such perennial rivers as the Goulburn, the Campaspe, the Loddon, and other tributaries of the Murray. In periods of drought, the southern portions of Victoria, including Gippsland, and the country below the so-called Dividing Range have generally held their own, while the northern portions have suffered severely. In periods of general rainfall the advantages of the southern country have not been so great.

From the foregoing sketch it will be obvious that no country in the world is more dependent than Australia on such knowledge as can be afforded by meteorology, and perhaps no country in the world is more disadvantageously placed, since at present there is no means of obtaining information from the waste of ocean which lies to the south.

Production and Export.

On what is it that the population of Victoria depends for existence? The total oversea exports of Victoria have risen in value from 13 millions in 1901 to 19 millions in 1912, but the progression has not been uniform. The 19 millions exported in 1912 are represented by the following items:—

				£
Butter and cheese	..	..	..	1,500,000
Wheat and flour	..	..	..	2,400,000
Meat, frozen	..	..	..	890,000
Wool	..	..	..	7,000,000
Hides and skins	..	..	..	1,310,000
Tallow	..	..	..	324,000
Gold specie	..	..	..	3,156,000
„ bullion	..	..	..	61,000
All other articles	..	..	..	2,383,000

It will be seen, therefore, that Victoria, like the rest of Australia, lives by the development of raw products entirely of a temperate climate. The bountiful return given to those who till the soil necessarily sets a high standard of wage for those engaged in other industries. The action of the Trades Unions and industrial legislation have further raised the nominal wage, but, as few manufactured articles are exported beyond Australasia, it is clear that the industrial fabric rests almost entirely on the farmer and rural producer.

Of the population of Victoria, roughly 1,400,000, no less than 650,000 live in Melbourne, and hitherto Melbourne has been practically the only seaport.

One of the problems that await solution, and to which Dr. Hugo Meyer, an American economist who spent some years in the Commonwealth, has given attention, is the extent to which this extraordinary centralization in Melbourne is due to the Government ownership of railways, and the adoption of what is familiarly known as the tapering railway rate. Any investigation into the railway problem, however casual, demonstrates the extraordinary extent to which civilization is dependent on railway freights. Towns can be made or unmade, transport developed or ruined, entirely by the adjustment of railway rates: and the connexion is often so concealed that only those who examine it carefully become aware of its enormous importance. Dr. Meyer's opinion is that Portland, the only harbor on the south coast of Victoria fit for the entry of deep-sea vessels, has been retarded in its development by the system of Government railways. Portland contains 2,000 people. Dr. Meyer thinks that it should have drained considerable portions of South Australia, Victoria, and even New South Wales, and should have contained about 120,000 people; and that this development would have occurred naturally, had it not been for the fact that the railways of the country were based on Melbourne, and are administered to a great extent in the interests of Melbourne.

The Land.

The land problem has been in evidence in all countries since the times of the *Gracchi*, and the history of Victoria furnishes no exception to the general rule. The cry of "unlock the land," which now belongs to the early history of Victoria, was followed by a system of free selection, under which farmers were enabled to take up blocks of land varying from 320 to 640 acres, on payment of nominal sums. In many instances the area of land selected was in excess of their capacity to utilize it, and probably many failures were due to the impossibility of clearing and utilizing such large areas without sufficient capital.

Victoria in its more settled condition is confronted with a new land problem, which for the moment baffles ingenuity so far as settlement is concerned.

The following tables show the size and number of the holdings of privately-owned land, of Crown land held in conjunction therewith, and of the area under cultivation and under pasturage.

VICTORIA.

1. Area under Pasture and Agriculture.

Area Occupied (Acres).

Year ended March.	Total.	Under Crop.	In Fallow.	Under Sown Grasses (not cut for Hay or Seed).	Under Natural Grasses.	Unproduct- ive.†
1901 ..	*	3,114,132	602,870	207,896	*	*
1902 ..	*	2,965,681	681,778	162,954,	*	*
1903 ..	20,577,675	3,246,568	492,305	565,635	16,273,167	
1904 ..	31,077,212	3,389,069	632,521	962,665	26,092,957	
1905 ..	32,181,048	3,321,785	853,829	953,543	24,424,192	2,627,699
1906 ..	34,518,526	3,219,962	1,049,915	1,040,335	25,993,204	3,215,110
1907 ..	35,309,359	3,303,586	990,967	1,095,642	26,737,250	3,181,914
1908 ..	37,313,392	3,232,523	894,300	1,095,471	28,517,766	3,573,332
1909 ..	37,825,674	3,461,761	1,034,422	1,029,711	28,890,720	3,409,060
1910 ..	38,085,574	3,658,535	1,175,750	988,671	29,100,868	3,161,750
1911 ..	37,732,803	3,952,070	1,434,177	991,195	29,040,458	2,314,903
1912 ..	38,062,887	3,640,241	1,469,608	1,041,772	28,126,287	3,784,979
1913 ..	37,218,798	4,079,356	1,627,223	1,085,346	27,586,020	2,840,853

* Information not available.

† Prior to 1912 the figures referred to barren and waste lands only, but in 1912 and 1913 they included all land in an unproductive state.

2. Land Occupied, 1906, 1910, and 1913.

(Excluding holdings which consist of Crown Lands only.)

Privately-owned Land.				Crown Land held in conjunction with that privately owned.	Total area occupied.	Area under—	
Size of Holdings (in acres)	Year.	Number of Holdings	Area occupied.			Cultivation.*	Pasture.
1 to 100	1906	19,173	721,669	554,759	1,276,428	196,580	1,079,848
	1910	23,305	836,826	442,413	1,279,239	225,227	1,051,012
	1913	26,113	915,493	374,511	1,290,004	245,498	1,044,506
	1906	16,121	3,459,291	937,727	4,397,018	789,330	3,607,688
101 „ 320	1910	17,583	3,686,498	1,209,660	4,896,158	839,664	4,056,494
	1913	18,483	3,819,680	1,216,829	5,036,509	875,525	4,160,984
	1906	9,319	4,497,331	1,604,280	6,101,611	1,197,536	4,944,075
	1910	9,676	4,623,839	1,900,058	6,523,897	1,182,254	5,341,643
321 „ 640	1913	11,212	5,475,942	1,191,890	6,667,832	1,424,020	5,243,812
	1906	3,876	3,164,404	1,063,166	4,227,570	735,263	3,492,307
	1910	4,354	3,553,261	1,800,551	5,353,812	863,080	4,490,732
	1913	5,221	4,187,010	1,241,667	5,428,677	1,075,000	4,353,677
641 „ 1,000	1906	3,466	5,112,200	2,200,867	7,313,067	1,009,034	6,304,033
	1910	4,159	6,178,744	2,484,133	8,642,879	1,254,392	7,388,487
	1913	4,544	6,748,985	1,852,529	8,601,514	1,546,611	7,054,903
	1906	617	2,106,732	1,996,797	4,103,529	180,884	3,922,645
2,501 „ 5,000	1910	749	2,571,444	1,348,979	3,920,423	298,146	3,622,277
	1913	820	2,803,419	1,085,769	3,889,188	352,258	3,536,930
	1906	220	1,567,251	471,271	2,038,522	44,347	1,994,175
	1913	267	1,825,862	342,848	2,168,710	111,910	2,056,800
5,001 „ 10,000	1910	239	1,651,979	1,397,984	3,049,963	85,379	2,964,584
	1913	267	1,825,862	342,848	2,168,710	111,910	2,056,800
	1906	195	4,134,067	176,916	4,310,983	43,521	4,267,462
	1910	175	3,298,227	145,420	3,443,647	45,770	3,397,877
10,001 and upwards	1913	151	2,652,966	404,710	3,057,676	39,606	3,018,070
	1906	52,987	24,762,945	9,005,783	33,768,728	4,196,495	29,572,233
	1910	60,240	26,400,818	10,709,200	37,110,018	4,796,912	32,313,106
	1913	66,811	28,429,357	7,710,753	36,140,110	5,670,428	30,469,682

* Including land in fallow.

The next table shows a more detailed classification of holdings of private land, and indicates the nature of the movement during the last three years.

3. Classification of Holdings of Private Land as at March, 1910, and March, 1913, compiled from Agricultural and Pastoral Statistics.

Size of Holdings.	1910.		1913.		Increase of Holdings between 1910 and 1913.	
	Number of Holdings.	Extent of Private Land Occupied.	Number of Holdings.	Extent of Private Land Occupied.	Number.	Per cent.
acres.		acres.		acres.		
1 to 5	3,469	10,334	4,158	12,627	689	19·86
6 „ 15	4,420	44,810	5,052	51,293	632	14·30
16 „ 30	4,854	107,998	5,259	117,141	405	8·34
31 „ 50	3,866	159,155	4,288	175,898	422	10·92
51 „ 100	6,696	514,529	7,356	558,534	660	9·86
101 „ 200	9,208	1,389,057	9,891	1,477,244	683	7·42
201 „ 300	5,422	1,362,833	5,698	1,428,071	276	5·09
301 „ 320	2,953	934,608	2,894	914,365	- 59*	- 2·00*
321 „ 400	2,951	1,064,036	3,179	1,149,040	228	7·73
401 „ 500	2,863	1,298,733	3,073	1,390,510	210	7·33
501 „ 600	2,212	1,221,823	2,451	1,352,613	239	10·80
601 „ 640	1,650	1,039,247	2,509	1,583,779	859	52·06
641 „ 700	918	617,603	1,267	851,486	349	38·02
701 „ 800	1,249	944,343	1,608	1,210,856	339	28·74
801 „ 900	1,014	867,671	1,135	966,221	121	11·93
901 „ 1,000	1,173	1,123,644	1,211	1,158,447	38	3·24
1,001 „ 1,500	2,583	3,175,340	2,784	3,417,332	201	7·78
1,501 „ 2,000	1,062	1,849,446	1,208	2,091,974	146	13·75
2,001 „ 2,500	514	1,153,958	552	1,239,679	38	7·39
2,501 „ 3,000	270	750,766	305	840,565	35	12·96
3,001 „ 4,000	329	1,145,013	348	1,208,523	19	5·78
4,001 „ 5,000	150	675,665	167	754,331	17	11·33
5,001 „ 7,500	161	969,101	185	1,125,383	24	14·91
7,501 „ 10,000	78	682,878	82	700,479	4	5·13
10,001 „ 15,000	79	977,245	78	963,016	- 1*	- 1·27*
15,001 „ 20,000	52	904,037	38	646,029	- 14*	- 26·92*
20,001 „ 30,000	22	564,250	20	494,237	- 2*	- 9·09*
30,001 „ 40,000	15	510,762	11	362,726	- 4*	- 26·67*
40,001 „ 50,000	5	225,438	3	135,558	- 2*	- 40·00*
50,001 and upwards	2	116,486	1	51,400	- 1*	- 50·00*
Total Private Land	60,240	26,400,818	66,811	28,429,357	6,571	10·91
Crown Land held in conjunction with privately owned land ..	..	10,709,200	..	7,710,753	..	..
Holdings of Crown Land only ..	1,571	975,556	1,892	1,078,688	321	20·43
Grand Total..	61,811	38,085,574	68,703	37,218,798	6,892	11·15

* Minus sign (-) indicates decrease.

The total area cultivated in 1910 was 4,834,285 acres, and in 1913, 5,706,579 acres.

The most conspicuous feature of the return, so far as it applies to rural land, is that the greatest aggregation is occurring in holdings of between 500 and 800 acres, and that the very large holdings of 10,000

acres and upwards are decreasing in number. This aggregation of areas between 500 and 800 acres constitutes the new land problem. It is difficult to generalize on such a subject, but the prevalent impression in the country is that an industrious and capable farmer, who has succeeded as a cultivator, always tries to increase the area of his holding. By the time the holding is of considerable size, he is getting on in life ; he is confronted with the price and the disorganization of agricultural labour ; he frankly abandons cultivation and takes to grazing. By grazing stock on his larger area, he can insure a comfortable living. His children move further afield to the Mallee, to the Riverina, or to Queensland, and take up holdings of their own. He employs little or no labour, with the result that the local schools decline by reason of the absence of children, and the trade of the districts declines by reason of the absence of workmen. So it comes about that, in some of the richest parts of Victoria, the population is declining, and the schools are not filled. To put it in the words of Professor Cherry, in referring to the closer settlement country, "it will come as a matter of surprise to most of our readers to learn that the closer settlement country, with its bountiful rainfall and boundless resources, is in many ways the least progressive part of Victoria. An anomalous state of affairs is found in a number of the richest districts. Taking the area under cultivation and the number of live stock kept, we find that during the last twelve years there has been an actual shrinkage in such districts as Warrnambool, Kyneton, Kilmore, and Lancefield. The land for miles around these centres is probably as rich as that in any part of the world. These districts should have closer settlement in all senses of the word. But instead of the farm areas being reduced by subdivision, they are steadily growing larger by aggregation. Whenever a farm comes into the market it is bought up by the wealthiest of the neighbours. The evil is intensified, because, as the land goes out of cultivation, the workmen leave the district and general stagnation ensues. As soon as the plough is laid aside, the stock-carrying capacity of the district becomes stationary. Hence we can at once see why the richest agricultural centres in Victoria are the least progressive. Not one-tenth of the available land is under cultivation."

As these lands have come under the operation of a State Land Tax, and in some cases possibly under the operation of the Federal Land Tax, it is quite evident that taxation is failing to effect the desired end.

The problem further raises the question—at what stage is the State entitled to step in and compel a man to conduct his business in the public interest in a way he does not desire ?

In fairness, however, it should be remembered that we are now witnessing the problem of the medium-sized holding, as against an earlier problem of the large holding. When an owner of the medium-sized property dies, a subdivision of his property amongst his children will effect great changes.

The problem alluded to leads naturally to a still more difficult economic question. Australia desires immigrants, and whatever difference of opinion may exist respecting immigration, all parties are agreed that there are two classes of people for whom there is always a demand—the farm and agricultural labourer on the one hand, and the domestic servant on the other. But

it is difficult to secure immigrants with sufficient capital, and the State possesses very little land which it can present to the immigrant who has no capital. That portion of the State still in the hands of the Crown is for the most part mountainous or heavily timbered, or otherwise unsuitable for immediate settlement. In fact, in some cases it may be said to possess a minus value, since the expenditure necessary to render it productive would more than counterbalance the value when that result had been obtained. Furthermore there arises the very natural feeling on the part of the Victorian, that, if the State has land to give away, he should have the first right of choice. There is no doubt, however, that a thrifty agricultural labourer can very rapidly become a land-owner under existing conditions.

The lack of intense culture on a very large scale in Victoria is largely associated with the labour problem. The difficulty lies not only in the high wages that are required, but in the instability of the labourer himself. This is partly the product of the country, and must, I think, be in part attributed to the farmer himself. So long as the labourer is a nomad, employed in busy times and dismissed in slack times, trouble will ensue; and not until the labourer with his wife and children are lodged in decent conditions on the farm, with perhaps a small holding of their own, will it be possible to make use of Victorian soil to the extent its quality deserves.

Forests.

The reference to agricultural land leads naturally to the forest problem. A considerable portion of Victoria is still forest. Forest, it is true, of variable value and character. The State forests and timber reserves do not exceed 4,000,000 acres. The mountain ranges in the north-east, from which the Mitta Mitta and other tributaries of the Murray flow, and from which emerge the Tambo and other rivers in the south, contain much valuable timber. I refer to this because of the impossibility of getting the timber away. The same remark applies to very much of the Australian forest country. Much of it is let on grazing licence at nominal rentals, and it is a matter of familiar experience that any forest let for grazing is inevitably burned. The scrubby country is cleared out by fire and a fair amount of pasture obtained. Any one who has watched timbered country at all carefully will arrive at the conclusion that the majority of the fires are deliberately lighted. The destruction of timber is enormous, and yet the selector has little option in the matter. In most instances he cannot send the timber to a market. He cannot dispose of it profitably, and he cannot use his land until the timber is destroyed. Yet we are informed that, in California, forests of Eucalyptus hardwood are being grown for the purpose of making such commodities as axe handles, which are imported into Australia, and we are informed that, in Australia, American softwoods are being grown which will probably be subsequently exported to the United States.

Dr. Heber Green states that some of the Eucalypti are well known for the durability and strength of the timbers, much stronger than oak, ash, or hickory, and others, for furniture making; but we use it mainly for the studs of buildings where the beauties of its grain will never be seen; and we blame the wood when it is cut at the worst period of the year and has never been seasoned.

The Department of Forests in the State of Victoria does its best, and its officers are alive to the damage which is occurring, but in my judgment something more is wanted. There should be a Chair of Forestry in one of the Australian Universities, so that expert knowledge would be available to any government which desired it. It is important that the occupant of the chair should be entirely freed from political control. Much of the damage in the past has been due to the giving permissive occupancy without fully surveying the country, *i.e.*, to political action.

Public-spirited officers who conduct the Forestry Department think it would be better to teach forestry in the forest. Whilst on general principles one is inclined to agree with such a proposal, I am afraid it is impracticable. It would mean building a new University in the forest. All the basic work relating to the scientific study of forestry can be done at the University. A two or three years' course for the degree of Bachelor of Science is required, followed by a term spent in the forests under the direction of the officials of the Department. It is, I think, desirable that the University that possesses the chair should also possess a Faculty of Forestry on which the University staff and the heads of the Government departments should be represented. Both in Canada and the United States a practice akin to the foregoing has been adopted.

Problems in Forestry in Victoria.

The following information has been kindly furnished by Mr. H. Mackay, Conservator of Forests :—

"Owing to its great diversity of climate, there is no difficulty in propagating and growing to advantage in Victoria the principal deciduous hardwoods and conifers of the northern hemisphere. Indeed, in many instances the growth of both conifers and hardwoods is much quicker than in Great Britain, or in any other parts of Western Europe, such as France and Germany, where careful systems of forestry have been established for over a century. A table contained in an article on Forestry in Victoria, which appears elsewhere in the handbook, shows the relative rates of growth of several of the principal species of conifers in Victoria and Great Britain. The problems which confront us, therefore, in South-eastern Australia have no bearing on the growth or acclimatisation of the best exotic timber-yielding species, but relate to the control and extirpation of insect pests, such as white ants and leaf-eating beetles; and, on the other hand, to the extraction of valuable by-products from our eucalypts, such as creosote, tar, tannin, &c.; as well as to the utilization of waste timber-fibres, bark, and saw-dust for the production of printing, writing, and packing papers.

The ravages of white ants, even amongst our densest hardwoods, are exceedingly great, and in this State no means of coping with the pest effectively have been discovered, except to burn out their mounds in spring, in order to prevent the migration of new swarms, which usually leave the mounds in October. It is true that they scarcely ever attack a large forest tree in the younger period of its growth, or in its prime, unless some injury has been caused to it by a falling tree, or by the weight of snow-drifts breaking some of its branches. It is when the tree is over-ripe and has less vitality,



NYORA GULLY, HEALESVILLE.

or when some breach has been made in the trunk by axe or fire, that their ravages usually begin, and it is noticeable that any over-ripe forest in deep shade, such as a creek-valley or a mountain gorge, is more liable to injury from white ants than a clear forest growing on steep slopes or on a well drained hillside.

As regards the attacks of leaf-eating insects in the natural forest, these are most destructive amongst the best tannin-yielding acacias, such as *Acacia decurrens* and *Acacia mollissima*. The latter species yields, in Victoria and Tasmania, our main supply of bark for the tanneries. The ravages of the small green beetle which strips the wattle of the whole of its foliage, and leaves it brown and desiccated, as if a fire had swept over the crown, is more pronounced in the spring season, when the weather is moist and warm. At times hundreds of acres are injured by this pest, the immediate effect being to reduce the flow of the sap throughout the body of the tree and to render the larger trees unfit for stripping during the whole of the season. Further, the tree receives a severe check in its growth, and, instead of being fit for stripping in the sixth or seventh year, it frequently has to be left standing for two or three years longer, in order that it may attain a diameter of six or seven inches in the stem. The practical method at present of coping with this pest is to run a light creeping fire along the surface of the ground among the clumps and groves of wattles when first affected, and destroy the pest in its early stages before it has begun to multiply. It is noticeable that it is always worst where wattles grow in dense thickets, and that, if the above preventive steps be taken in time, solitary wattles grown in the clear are but little affected. Owing to the large acreage of tannin-yielding wattles in our State reserves, and the height of the trees, the use of liquid or dry sprays would be of little practical benefit.

As regards the extraction of by-products, creosote is one of the most valuable preservatives of timber for public works and railways, and it is also the best material for extending the life of young pole-timber when used for telegraphs and telephones. The price of this material, when imported from England and America into Australia, is always prohibitive for use on a large scale, and hence it is of the first importance that a cheap method should be discovered of extracting wood-creosote from the enormous masses of timber in our forests.

Year by year as sheep-grazing areas become smaller, the area of private land devoted to the growth of tannin-bearing acacias becomes more restricted in this State. The Forest Department maintains considerable reserves and plantations of these trees, but still the supply is sufficient for the home market only, and the profits at present do not justify the planting of extensive areas under tannin-yielding wattles. Many other species, however, in our forests yield a useful tannage, such as the ironbark (*Eucalyptus sideroxylon*), the blackwood (*Acacia melanoxylon*), the banksias, and the belar (*A. casuarina*), the latter being found in quantities in the western Mallee and western division of New South Wales. As the general advance in wages has materially increased the cost of manufacture of leather, the production of a cheap tannage, such as a liquid extract from a combination of several kinds of bark, is of great importance. Here again lies an opportunity for profitable chemical research.

Again in another branch of industry, the supplies of spruce for paper-making are steadily dwindling in several parts of northern Europe, while in Canada, still the source of the largest forest supplies, the mills have gradually to go further afield in order to provide the immense quantities required for the American market, as well as for the export trade to Europe. Hitherto no firm here has had the courage to embark on the making of paper from the fibre of undergrown timbers or bark, although in a small way excellent writing and printing papers have been made in England from Victorian and Tasmanian ash and messmate. When one considers the great and unavoidable waste left in our forests from the operations of saw-mills, as well as the immense quantities of decaying and diseased trees in all stages of growth, there should be a wide field for success in the manufacture of this useful product, by the mechanical as well as the sulphite process."

Agriculture.

Turning in detail to the problem of agriculture, which after all is the basis of existence in Victoria, the problems are legion. From the educational point of view agriculture is being dealt with in many ways. There is an agricultural college and experimental farm at Dookie with an area of about 6,000 acres, which is well equipped, and which accommodates 80 students. There is another college and farm at Longerenong, near Horsham, which accommodates about 40 students. There is a School of Agriculture at the University, which is presided over by a Professor of Agriculture, but which is not provided with an experimental farm. The Government has secured an experimental farm of 1,100 acres at Werribee, some 20 miles from Melbourne, where preliminary experimental work is being conducted. Under the aegis of the Education Department a number of agricultural high schools have made their appearance—schools which were described by the Scottish Commissioners as "secondary schools with an agricultural bias." Each primary school throughout the country has its little experimental plot and garden. It will, therefore, be seen that agricultural education in Victoria falls under four different headings:—

- (1) The Education Department controlling the Primary Schools and Agricultural High Schools.
- (2) The Council of Agricultural Education, a semi-political body controlling Dookie and Longerenong Colleges.
- (3) The Department of Agriculture, a purely political department, which possesses administrative functions and controls the experimental farm at Werribee.
- (4) The Agricultural Department of the University.

To these must be added the Department of Irrigation, with which Dr. Elwood Mead's name is so closely associated.

The problem which faces the statesman who desires the welfare of the State is the co-ordination and organization of these four agencies in such a manner that the educational is separated from the administrative; that purely educational problems are controlled by one body, and purely administrative problems by another.

The following quotations from Professor Cherry and Dr. Cameron give some idea of the multitude of the problems which await solution :—

AGRICULTURE.

By Professor Cherry, Melbourne University.

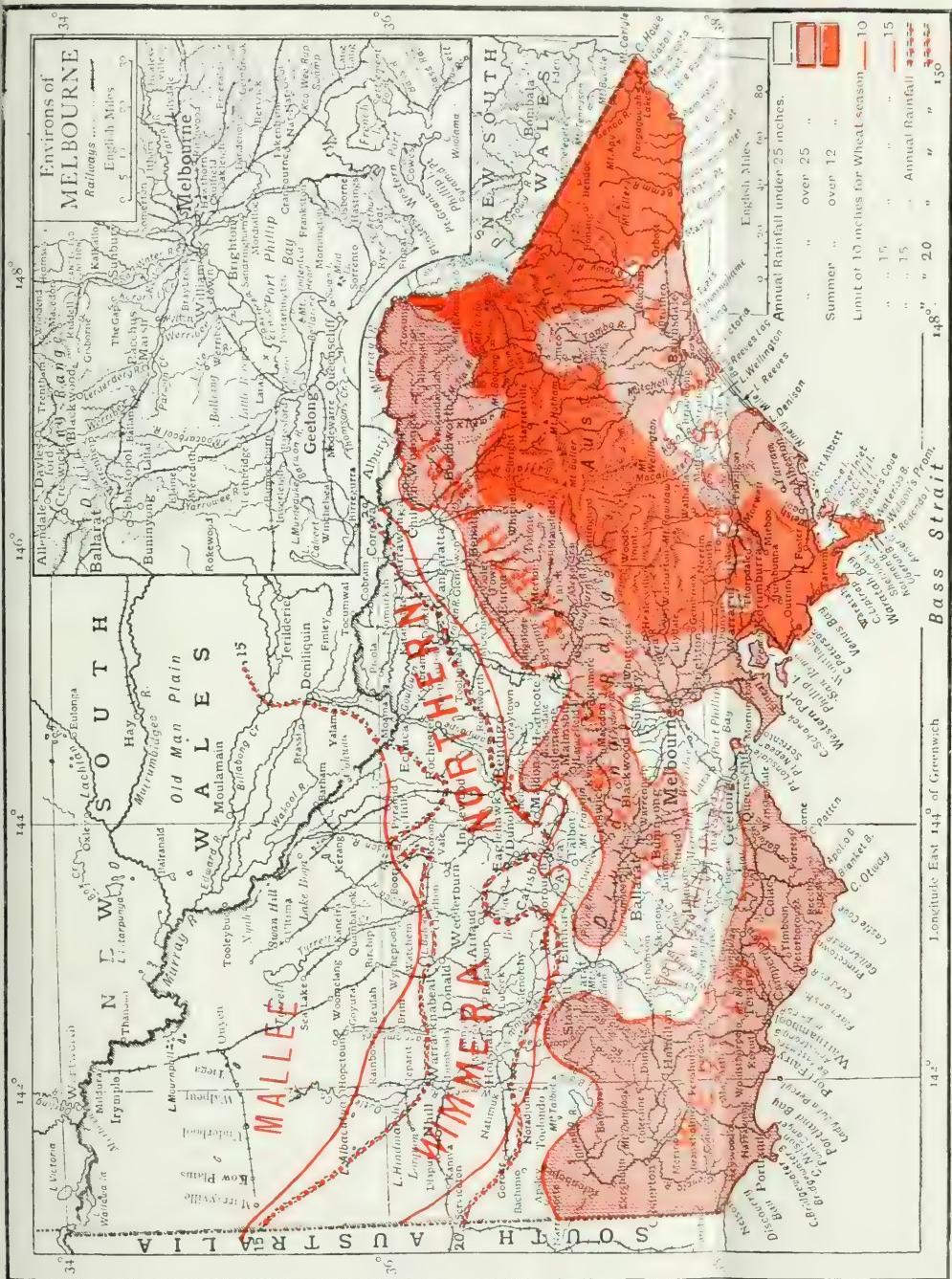
“ 1. *The 10-in. Line of Rainfall.*—In the region of winter rains in the southern half of Australia there is a belt of country comprising about 500,000 square miles, or 320,000,000 acres. The rainfall varies from 8 to 20 inches. It mostly falls in the winter months, and it is marked by great regularity from year to year. All this land carries a fairly heavy growth of mallee and other varieties of scrub, but grows little fodder of a useful kind. New South Wales west of the Darling may be taken as a type of the whole of it, and this country is more developed than any other part. It carries a sheep to 10 acres. The problem is to find a fodder superior to salt bush and which will grow from its seeds with the first autumn rains. If this country could be made to carry a sheep to 3 acres the number of sheep in Australia would be more than doubled.

2. Heavy cumulus clouds often form about the ascending smoke from scrub fires. There is also a widespread impression that the rainfall at Kalgoorlie and Broken Hill (both of which lie in this region) has been modified by the furnaces of the mines. These facts require investigation, and also the conditions under which precipitation from rain clouds may be brought about. So far as I can see the results of experiments tried some years ago in America are in no way applicable to Australian weather conditions. (Quotation from Spencer and Gillen *re* rain at Oodnadatta.)

3. The extension of wheat-growing beyond 10-in. line of winter rains. Corresponding railway extension.

4. *Heavy yield of varieties of Wheat under Irrigation Conditions.*—Under good farming conditions, since the introduction of improved varieties, yields without irrigation of 40 bushels to the acre are not unusual. With irrigation it should not be difficult to raise the yield by 50 per cent. At present the yield is limited by the rainfall; under irrigation the yield should be dependent on the plant food in the soil. The present practice of sowing 45 lbs. to the acre could be increased to 2 bushels. Irrigation is used for wheat in order to ensure early seeding on a well-prepared seed bed in April. The flooding takes the place of the early rains. The crop matures by the winter and spring rains without any further irrigation. Flooding to the extent of four inches in March makes every season in the Victorian irrigation districts equal to a year of first-class rainfall. As no further watering is necessary in spring, there is no additional danger of rust, while the sample of grain is indistinguishable from that grown on the adjoining dry farms. It will be seen that owing to our winter rainfall the irrigation of cereals is a special proposition for southern Australia. The cost of one watering (5s. per acre) is easily covered by an additional yield of 2 bushels at harvest.

5. The utilization of the skins and carcasses of the rabbits in the interior country is largely a matter of labour and technical skill. Scientists must recognise the fact that destruction by poison is absolute waste, and that



The unshaded portion indicates the Wheat Belt, and the lightly colored part country suitable for Closer Settlement. The deviations of the lines of 10 and 15 inches for the wheat season from the lines of 15 and 20 inches for the whole year is specially noticeable in the Western Mallee and Wimmera.

extermination by disease is running counter to the law by which the virulence of the micro-organism and the resistance of its host always tend to assume a position of equilibrium. What is required is a plan by which rabbits may be exported, even at a small loss."

AGRICULTURE.

By Dr. Cameron, Director of Agriculture.

PLANT BREEDING—WHEAT.

"1. *Breeding of Wheats which will be drought-resistant and capable of growing outside the existing rainfall margin of profitable Cultivation.*—Vast areas of pastoral country in the interior of New South Wales, Queensland, South Australia, and Western Australia, where now a few sheep to the square mile are kept, could be profitably brought under the plough if new varieties of wheat could be evolved capable, as are many native grasses, of growing under low rainfall.

This is likely to be best achieved by the crossbreeding and hybridizing of our local varieties with others which have been accustomed to growing in the very driest regions of Asia, Europe, and Africa.

The breeding of drought resistant wheats is likely to be of the greatest value to the wheat industry of Australia. Since the limiting factor in Australian agriculture is soil moisture, seasons of low rainfall in Australia are the seasons when primary production is limited.

2. *The breeding of Wheats which will combine Quality and Prolificacy.*—Most of the varieties in general cultivation at the present time are wanting in strength and in gluten content. Varieties have been evolved by Farrer, such as Bobs, Comeback, and Cedar for example, which possess high milling excellence and great strength, but they are not prolific varieties, and are therefore not cultivated by the farmer. Research on the part of the wheat breeder is required to evolve a wheat which combines the high milling and baking qualities of these wheats with the attribute of prolificacy.

3. *Rust Resistance.*—The ravages of red rust (*Puccinia graminis*) are responsible in some seasons for the loss of hundreds of thousands of pounds sterling. While much has been done by the late W. Farrer in the evolution of rust-resisting wheats, much still remains to be done, and there is no variety at present in general cultivation which is immune from rust.

4. *Other Cereals.*—Similar work is required with other cereals. The varieties of barley, oats, and rye grown in Australia are mostly those obtained in the first place from humid countries in the Northern Hemisphere. Practically no work has been done on the evolution of drought-resistant local varieties.

5. *Native Grasses.*—Many of the native grasses and saltbushes of Australia are extremely drought-resisting and grow well in the most arid parts of Australia. No sustained effort has been made to develop and improve these local grasses, or to obtain suitable varieties by hybridizing. Investigation is also required concerning the factors determining the annual, biennial, and perennial habit of grasses and fodder crops under Australian conditions.

SOIL PROBLEMS.

1. *The Conservation of Soil Fertility.*—Like most countries in which extensive agriculture is practised, many of the soils in the older cultivated districts are falling off in fertility. In these districts the land which has been cropped for any length of time will not compare in productive capacity with the virgin land. The restoration of the soil to its pristine fertility, and the development of a permanent system of agriculture in which that fertility is maintained even though maximum crops are removed, is a problem demanding very careful research.

The general aridity of the climate and the rapidity with which organic matter is lost from the soil under Australian conditions make the problem more complicated.

2. *The Position of Nitrogen in Australian Agriculture.*—One of the most important limiting factors in the successful cultivation of soils in humid countries of the Northern Hemisphere is the amount of nitrogen present in the soil. Australian soils are, compared with those of older countries, comparatively poor in nitrogen and in humus, and yet they do not respond to applications of nitrates. Indeed, over the whole wheat area nitrogenous manures are absolutely unprofitable. The full explanation of the causes opens up a wide field of biological research.

3. *Soil Moisture.*—The limit to successful cropping in the vast majority of Australian soils is the moisture content of the soil. The amount of water required by our various farm crops at each stage of their growth, the factors governing the amount of moisture required, the seasonal movements of soil moisture, and the factors governing the conservation of soil moisture have a most important bearing on our agriculture, and as yet very little work has been done on these important problems.

4. *Development of more intensive Forms of Agriculture.*—Hitherto, owing to the comparative cheapness of agricultural land and the large areas held by individual owners, the methods of agriculture practised have been extensive as opposed to intensive. Large areas have been cropped and small average returns have been obtained. With the increase of population and with the consequent inevitable rise in land values, economic conditions will demand more intensive systems of culture. Hitherto the cheapness of the land has enabled one crop to be taken off in three years with a profit; but the necessity has now arisen for the soil to be more fully utilized.

In each of the climatically different districts of the State there is a vast amount of useful work to be performed in determining the most financially suitable type of rotation for each district under the changing economic conditions.

STOCK PROBLEMS.

1. *Sheep.*—The development of distinct types or breeds of sheep having special suitability as regards both wool and mutton to the climatically different districts of Australia.

Investigation of the parasitic diseases of sheep, particularly lung worm.

2. *Cattle.*—The suppression of pleuro-pneumonia contagiosa. Investigation of the diseases, prevalent in lean years, known as impaction, paralysis, crippleness, &c.

Investigation with the object of regulating the breeding and feeding operations to the end of improving the milk and butter fat yields.

GENERAL PROBLEMS.

1. *Refrigerated Transport.*—Research with the object of finding out the most suitable method of conveying perishable produce, including soft fruits, in cool storage from Australia to Great Britain.

2. *Bitter Pit in Apples.*

3. *Irrigation.*—Investigation concerning the prolificacy, yields, and durability of various grasses and fodder crops, for both soiling and grazing under irrigation."

Live Stock.

If we turn from agriculture to the rearing of animals again, we reach a problem in which scientific knowledge is likely to be of vast service. The following figures give the number of poultry, and horses, cattle, sheep, and other animals in Victoria, and in the Commonwealth.

NUMBER OF POULTRY IN VICTORIA, 1901 AND 1911.

Class of Poultry.	Number.		
	1901.	1911.	
Fowls	3,619,938	3,855,538	
Ducks	257,204	288,413	
Geese	76,853	59,851	
Turkeys	209,823	190,077	

I.—VICTORIAN LIVE STOCK, 1900 TO 1912.

Year.	Horses.	Cattle.	Sheep.	Pigs.	Goats.	Camels.	Mules.	Donkeys.	Ostriches*
1900	392,237	1,602,384	10,841,790	350,370	27,939†	..	21†	12†	..
1901	387,277*	1,623,282*	10,673,265*	334,295*	..	..	..	..	..
1902	382,317*	1,644,180*	10,504,741*	318,220*	..	..	..	..	..
1903	377,357*	1,665,078*	10,336,216*	302,145*	..	..	..	..	..
1904	372,397	1,685,976	10,167,691	286,070	..	..	..	..	..
1905	385,513	1,737,690	11,455,115	273,682	..	..	..	..	..
1906	406,840	1,804,323	12,937,440	220,452	..	..	..	..	..
1907	424,648	1,842,807	14,146,734	211,002	..	..	..	..	..
1908	424,903	1,574,162	12,545,742	179,358	..	..	..	..	..
1909	442,829	1,549,640	12,937,983	217,921	..	..	..	..	..
1910	472,080	1,547,569	12,882,665	333,281	..	..	..	..	..
1911	507,813	1,647,127	13,857,804	348,069	6,217†	2†	6†	9†	44†
1912	530,494	1,508,089	11,892,224	293,450	..	..	..	..	..

* Statistics not collected.—Figures supplied by interpolation.

† Census figures.

II.—COMMONWEALTH LIVE STOCK, 1900 TO 1912.

1900	1,609,654	8,640,225	70,602,995	950,349	..	..	..	..	..
1901	1,620,420	8,491,428	72,040,211	931,309	..	..	..	..	..
1902	1,524,601	7,062,742	53,668,347	777,289	..	..	..	..	..
1903	1,546,054	7,247,508	56,932,705	837,368	..	..	..	..	..
1904	1,595,256	7,840,520	65,823,918	1,062,703	..	..	..	..	..
1905	1,674,790	8,528,331	74,540,916	1,014,977	..	..	..	..	..
1906	1,765,186	9,349,409	83,687,655	813,569	..	..	..	..	..
1907	1,871,714	10,128,486	87,650,263	754,101	140,906*	7,049*	966*	2,492*	1,237*
1908	1,927,729	10,547,679	87,043,266	695,691	147,926*	7,692*	1,118*	3,025*	1,513*
1909	2,022,917	11,040,391	91,676,281	765,137	327,587	7,635	1,149*	3,440	1,579
1910	2,165,866	11,744,714	92,047,015	1,025,850	313,917	8,426	1,350*	3,807*	1,739
1911	2,279,027	11,828,954	93,003,521	1,110,721	280,086	8,403	6,272	..	1,939
1912	2,408,113	11,377,259	83,244,576	845,255	270,973	10,045	6,973	..	1,891

* Exclusive of Queensland.

One of the most extensive of disasters met with in Australia in recent years has been the destruction of sheep due to the fly. The blow-fly affects the sheep at lambing time and causes very heavy mortality. The difficulty has arisen since the drought of 1903, and is variously attributed to the destruction of insectivorous birds by the use of rabbit poison and other causes. But the blow-fly is worst in districts in Queensland, far beyond the rabbit wave, and the loss due to this cause is estimated at hundreds of thousands of pounds annually. Clearly the solution will only be found by a scientific investigation into the habits of the fly.

The difficulty is very typical of Australian problems. One never knows when a new biological problem of the kind will arise, or what vast industrial consequences may follow. It is, for example, doubted whether the poisoning of rabbits has any real efficacy. There is no doubt poison kills very many rabbits, but it never extirpates them, and it is suggested that it extirpates their enemies, the native carnivora.

There is no doubt that by selective breeding the wool fleeces have been enormously improved and increased. The problem of the future appears to be to breed a sheep which is alike profitable as a wool bearer and a meat producer.

Enough has been said to show how manifold are the problems connected with agriculture and stock raising, which are, and will continue to be, the staple industries of Victoria. But the Veterinary School and Research Institute of the University of Melbourne, presided over by Professor Woodruff, and the various agricultural agencies to which reference has been made, should, when properly organized, turn out an increasing number of men and women able and willing to undertake these problems of practical research.

Closer Settlement.

When the products of the soil and the yields of the mines have been considered, we have completed the survey of the wealth of Victoria which is capable of export. The ease with which a livelihood can be obtained by the farmer sets a high scale of payment for those who may provide him with the commodities he desires; and in the last ten years the extraordinary organization of the industrial unions has accentuated the payment of the city artisan. The result is that the oversea export of manufactured articles on any considerable scale is practically an impossibility for the moment. Any change in this direction must come gradually, and it is clearly to the interest of the State to increase its primary production and successfully develop the production of articles which the world's market always requires, and which can be produced in this favoured State certainly as easily as in any other portion of the globe.

The policy of the Closer Settlement has been widely adopted in certain districts, and is being pursued with energy in spite of many obstacles and difficulties. It is linked essentially with irrigation, and the observations of a member of the Closer Settlement Board, Mr. Lee, on agricultural problems are worthy of notice:—

AGRICULTURE.

By F. E. Lee, Closer Settlement Board.

"When one considers that the Commonwealth of Australia embraces an area of 2,974,581 square miles, of which 1,140,830 square miles have an

annual average rainfall of under 10 inches, 637,470 square miles from 10 to 15 inches per annum, 355,947 square miles from 15 to 20 inches, 488,852 square miles from 20 to 30 inches, 201,860 square miles from 30 to 40 inches, and 149,622 square miles over 40 inches, it suggests the idea that, as about 70 per cent. of the area of Australia possesses an annual average rainfall not exceeding 20 inches, the primary industries must of necessity be largely pastoral and the growth of cereals.

1. *Wheat Growing.* - Whilst the area devoted to wheat growing shows a small progressive increase from year to year, the average yield per acre remains extremely low. The average yield of wheat per acre in Australia during the past ten years is only 10·48 bushels. The generally accepted reason for this low average yield is unfavorable climatic conditions, but a comparison with similar returns of other countries with less favorable soil and climate, suggests the thought that the fundamental cause of the low average wheat yield in Australia is largely due to imperfect methods of cultivation coupled with the growth of varieties which are not best adapted to our local conditions.

The problem therefore of permanently improving the yield of one of our primary products, offers a fine field for investigation at the hands of properly directed and equipped scientific research. It is obvious that the wheat-grower has neither the time, inclination, nor training to patiently follow an elaborate system of experiments over a term of years. What would appear to be necessary in this connexion is the initiation of a comprehensive series of analyses to determine the main physical and chemical characteristics of soils lying within the territory subject to a 10 to 20 inch annual rainfall. Such an outline soil survey is by no means as formidable as it appears at first sight. The range of soils to be covered is limited to a comparatively few well-defined types. Classification of soil samples in the field would greatly minimize the number of laboratory analyses necessary. The analyses themselves need not cover more than a physical examination, in order to determine the composition, humus content, and moisture holding capacity. With these fundamentals established in a general way, a considerable amount of light is thrown on the behaviour of soils under different methods of cultivation. The second stage of a practical soil survey is only reached when the investigator has a foundation to work on. The capillarity of soils and movement of subterranean water, the temperature, &c., as profoundly influence crop returns as do other causes, and some reliable data on these points is urgently needed to lift Australian wheat production on to a higher plane.

Another and equally important phase of the problem under review is the creation by cross fertilization and selection of wheat varieties possessing characteristics specially adapted to our soil and climatic conditions. Such objectives as the elimination of superfluous straw in order to minimize the transpiration of scanty moisture in districts of low rainfall, immunity to fungoid diseases and improved flour-producing capacity are well worthy of the attention of scientific research.

Much valuable work in these directions has already been carried out, but it loses value by want of co-ordination and the results might with advantage be made to have a more national incidence than is the case at present.

When one reflects that wheat is the sole crop which can be relied upon to push back the borders of settlement into immense areas of low rainfall, its economic value is such as renders it worthy of the most searching investigation by the trained scientific mind.

2. *Pasture Improvement*.—It has already been stated that by reason of its climatic conditions Australia must always be dependent in a large degree upon the success of its pastoral industries. The export value of our wool, mutton, butter, &c., is the life blood of Australian trade. How much, or rather, how little attention is given by those dependent on pastoral industries to the improvement of the pasture lands they are wholly dependent on for commercial success? The answer is, hardly any at all.

Here again is another field for scientific research of an intensely practical nature. The nutritive value of native and introduced grasses, their habit of growth and disposition to thrive or otherwise within defined limits of rainfall and varying soil conditions, have yet to be systematically investigated and the propagation of seed of suitable varieties encouraged. One wonders why such obvious matters have not received a greater measure of attention from those dependent on stock husbandry years ago. Perhaps the principal reason for neglect of this elementary precaution is the fact that Nature is beneficent and the need for improvement does not appear to be pressing except in time of drought.

We cannot, however, shut our eyes to the fact that Australia is subject to periodical dry seasons, during which there are heavy losses of stock. Such losses are economically bad, and can to some extent be relieved by an improvement of existing conditions. It is not suggested that scientific research can prevent dry seasons, but it is asserted that the pastoral industries are of such transcendent importance in Australia that no effort should be spared to render them less liable to the effects of drought.

3. *New Industrial Crops*.—The range of soils and climate in Australia is so extensive that there is opportunity for the introduction and successful commercial development of an infinite variety of new industrial crops. Australia to-day stands in peculiar need of new crops. The tide of immigration appears to be setting in this direction, and with the influx of new settlers will come new ideas and new methods of farming. Much economic loss can be avoided by the accumulation of fundamental knowledge in regard to new industries. The increasing cost of labour must be balanced by a corresponding reduction in the other costs of production. The growing of cotton, coffee, rice, sugar beet, and fibre with commercial success is possible. The services of the specialist are required to carry out the preliminary investigations without which failure and discouragement are inevitable. As a profitable field for capital and labour the encouragement of new industrial crops cannot be too strongly advocated.

If Australia is destined to play a leading part in the world's affairs, its resources cannot be more strikingly illustrated than by the successful development of new industries which will attract the most desirable class of immigrants from other countries."

Mining.

So far as mining is concerned, Victoria has illustrated developments which have been followed in other countries. The population in Victoria before the great gold discovery was 76,000. Ten years later it was 510,000. The gold that was easily wrung from the soil was soon obtained, and expensive quartz mining replaced alluvial operations. The industry would not support the enterprising and the hardy and energetic population which had poured into the country, hence agriculture gradually increased in importance. It is a problem well worth investigation by the economic historian to accurately assess the indirect gain to the country produced by the gold discovery. In like manner the gold discoveries at Kalgoorlie and Coolgardie in Western Australia have ended in the development of Western Australia as an agricultural country, although prior to those discoveries it was popularly regarded as a land of heat and sand.



GOLD MINING. HYDRAULIC SLUICING.

Gold mining in Victoria is steadily declining, and some of the older mining centres are somewhat pathetic in their decay; but there is no doubt that the decline has been aggravated by certain human factors. Gold mining, like horse racing, has too often been associated with irresponsible economics. Diverse kinds of fraud have occasionally been associated with mining and have tended to keep the investor away. Latterly the immense power of the industrial unions in raising wages has further operated against mines which simply yielded a margin of profit. These causes, however, must be regarded as subsidiary; the main cause of the decline is the fact that gold to be obtained requires more expensive methods. Still there are many problems connected with mining awaiting scientific research, the successful solution of which might add immensely to the wealth of the country.

Professor Masson alludes to the possible saving of gold from tailings and refractory ores, which he says is an old business, but the last word has not yet been said on this point. The question of concentration and further treatment of Broken Hill blendes has been solved mainly by work done and begun in Victoria, and such work is still in progress.

Professor Skeats suggests the investigation of the occurrence and origin of the "shoots" of gold in gold quartz veins, and of how far gold values near the surface of Victoria have been affected by secondary enrichment.

Mr. Herman, Director of Geological Survey, states his case both with regard to gold and coal in the following terms :—

"On scientific guidance for the location of payable, or the payably auriferous, portions of lodes and alluvial leads will materially depend the future gold production of the State. The easily seen and easily found deposits have been mostly exhausted and blind stabbing (unavoidable to some extent in nearly all mining enterprises) will require more and more the assistance of systematic surface and underground geological surveys. Associated with the structural field work the special branches of petrology, palaeontology, and chemical analysis will play essential parts. Similar guidance is necessary for the discovery and development of our mineral resources in general. Important mining development schemes at present in progress are based on the researches of the scientific staff of the Mines Department, and extensive boring operations for deep alluvial gold deposits, black coal, and brown coal are being conducted under the same control. The existence of the State coal mine is entirely, and of several private coal mines largely, the result of this work. The brown coal deposits of other countries have already proved of great economic importance. The brown coal of Victoria is in beds of great thickness and good quality. By drilling operations following geological examination we are ascertaining its geological and geographical distribution. By chemical and physical tests its value is being determined as fuel—directly used, briquetted, or in gas power plants ; and as regards the commercially useful by-products derivable from it, such as heating or lighting gases, ammonium sulphate, tar, benzine, paraffin, various oils, dyes, &c. Allied to the exploration of our brown coal resources is the highly important question of reducing the cost of transmission of electrical energy for long distances, a practical problem that is receiving the constant attention of electrical scientists. The location and selection of building stones, materials for road-making, fertilizers, cements and plasters, numerous manufacturing industries, and the investigation of underground water supplies, all require similar geological and chemical aid. Topographical and physiographical surveys are required for the suggestion and estimation of big engineering works such as railways, roads, and water supply for irrigation and domestic uses, as well as for defence purposes. Ore dressing, smelting, and ventilation of mines, with their constantly arising new difficulties and problems, are ever calling for the aid and research of the physicist, chemist, and engineer. The successful development of one metallurgical process, that of mineral flotation, almost unknown fifteen years ago, has meant profits of millions sterling for Broken Hill alone."



WALHALLA.

Professor Payne draws attention to the difficult problem of mining ventilation in the deep Bendigo mines, and the possibility of work at depths greater than a mile.

THE BROWN COAL PROBLEM.

The brown coal problem is so important that I add a letter from the Department of Mines :—

(Letter from Secretary for Mines, Melbourne, dated 31st December, 1913.)

“ Sir,

I have to inform you in answer to your request for information respecting the brown coal deposits in Victoria that they are the thickest and most extensive known in the world, covering, probably, not less than between 200 and 300 square miles, and varying in thickness from a few to nearly 800 feet. Various estimates have at times been made, but in the Latrobe Valley and the Welshpool-Alberton districts there is, on a conservative estimate, about 30,000,000,000 tons available.

A typical analysis of Victorian brown coal is as follows :—Volatile hydro-carbon, 23.00 ; fixed carbon, 26.00 ; water, 50.00 ; ash, 1.00 ; total, 100. It is superior to the German brown coals which are extensively used for briquetting and for generating electricity, the latter being produced for as low as about ½d. in English money per unit.

About 1889, the Austral Otis Co. built a briquetting plant, which was installed at Morwell, and nearly 1,000 tons of briquettes were sold in Melbourne at £1 per ton. That is the only attempt so far made to utilize the coal on a commercial scale in Victoria. The Altona Bay Colliery has sold during recent years quantities of the brown coal for fuel.

Probably the principal reason why it has not been put to greater commercial use is the competition of New South Wales black coal and the limited requirements for such a fuel.

I have the honour to be,

Sir,

Your most obedient servant,

P. COHEN,

for Secretary for Mines.”

SUGGESTIONS BY THE CHAIRMAN OF THE COUNTRY ROADS BOARD.

Further light is thrown on the phases of the subjects dealt with by the following statement of Mr. Calder, of the Country Roads Board :—

“ A question of paramount importance is the treatment of soils, especially poor soils, of which considerable tracts exist in this country. Certain poor soils are, no doubt, adapted for fruit-growing, but it is possible that extensive tracts of what is now considered poor and useless country might be developed by treatment with suitable manures or by the planting of suitable grasses. In the Orbost, Omeo, and Tambo districts, there are tracts of rich basaltic country covered with snow for certain months in the year. Some means might be investigated for putting these areas to profitable use.

2. The development of our timber reserves and the question of re-foresting existing treeless areas.

3. The utilization of the brown coal deposits such as those at Morwell, where there are immense tracts of this product waiting some means of being put to practical commercial use.

4. The investigation of the stone deposits and their relative suitability for road stones."

The Roads Board, of which Mr. Calder is the Chairman, proposes, in conjunction with the Engineering Staff of the University, to investigate the last-mentioned question in the near future.

In concluding this portion of the subject I can only express my own feeling that wherever I have looked into any practical problem in Victoria connected with wealth production, the field of investigation appeared practically illimitable. The failure to effect rapid solution of difficulties has been invariably due to two causes, the lack of trained investigators who were willing to undertake the work, and certainly, until recently, the lack of confidence in scientific investigators on the part of practical men.

Politics and Economics.

In the field of politics and economics the problems are still more fascinating and just as numerous. Victoria is governed by the vote of all those over the age of 21 who have not been convicted of felony. Female suffrage has existed in Australia for many years, though it was adopted in Victoria comparatively recently. A careful investigation into the changes effected by the female vote in Australia in general, and in Victoria in particular, would be of extreme value to older countries. In passing, I may record my own decided conviction that it has produced little or no change for better or for worse in the general course of legislation. It has not purified public life in the sense in which the term is generally used; it has not enabled women to obtain adequate treatment in the subjects they are specially interested in. It has, in my judgment, made but one substantial alteration—the capacity of women to organize political associations has been demonstrated repeatedly, and the interest aroused in public affairs in women is in conspicuous evidence. Women can only obtain what they want in matters about which they feel strongly by combining as women, and voting for their candidates irrespective of any other consideration, and as this course might lead the country into disastrous positions it has never been seriously contemplated. To the political student, nothing will be more interesting than the attempts made in Australia to establish a second chamber—the chamber of review. The absence of historical institutions and the popular dislike in theory to property representation, have ended in many curious attempts being made to found a second chamber differing in some way from the more popular one; and the developments which have occurred will be of profound interest.

In the industrial world, the establishment of the system of Wages Boards and Arbitration Courts is a conspicuous feature. The Wages Boards of Victoria were established in 1896 with the definite and deliberate purpose of raising the wages paid to certain female employés engaged in the clothing trade. There was evidence that these workers conducted the business in their own homes and received small remuneration. The Wages Board system was applied, and naturally had the immediate effect of raising

the wages considerably. At this time, 1896, it was difficult to obtain domestic servants at any reasonable price, and the Wages Board system really raised wages in an industry which was popular for extrinsic reasons, whilst employment could have been obtained at higher wages in a less favoured calling, that of domestic service. But the success of this easy and royal road to better conditions, which made its appearance on a humane wave, was rapidly followed by the establishment of Wages Boards in callings in which the same necessity did not exist. Little by little the system has been extended to practically all the city industries, with the result that at all events nominal wages have steadily risen. It has never been applied to private domestic service. The domestic servants have never had a union, and have never gone on strike, yet their wages have risen very greatly, and their conditions of work have greatly improved; a fact which those who subject the problem of industrial unionism to a critical analysis may well note with interest. But the Wages Board principle has never yet been applied to the rural worker. The Arbitration Court method, which exists throughout the Commonwealth, has been applied to the work done on the properties of the pastoralists, but the small farmer and the cultivator have never yet been face to face with the union problem. If a rise in wage similar to that which has taken place in the cities were to take place in the agricultural industry, it is probable that agriculture would decline and a large portion of the country would revert again to sheep breeding.

To me the fundamental political problem is the present necessary antithesis between the interest of the small farmer and the industrial unions. It is on the farmers' prosperity that the prosperity of the city is based, and the application of crude union methods to those he employs might damage the whole structure. Students may find much to admire in the Wages Board system. It at all events provides for a meeting of employer and employé. But they would do well to remember that neither the Arbitration Court which presides over the Commonwealth, nor the Victorian Wages Board system has ever yet made awards on a steadily declining revenue in times of depression. The test of their efficiency will be applied when that unfortunate but inevitable period occurs.

In industrial matters, the problem of technical education is giving as much trouble in Victoria as in any other portion of the world. The system of apprenticeship has broken down because of the subdivision which takes place in modern industry, and the problem of its replacement by a system of technical education, is engaging the earnest attention of the Education Department of Victoria. Those who can spare the time would do well to visit the Junior Technical Schools and Technical Colleges in Melbourne, and the Agricultural High Schools at Ballarat or Wangaratta.

Of special and important problems far removed in character from the above, examples are given in a memorandum by Mr. P. Baracchi, Government Astronomer for Victoria, which appears in an appendix to this article.

Education.

In Victoria, apart from certain schools owned by religious corporations and private persons, which provide instruction for about 50,000 pupils, the whole of the system of primary and secondary education is in the hands of the State.

There are a number of technical schools of recent establishment, such as the Working Men's College, and the Swinburne College at Glenferrie, in which excellent work has been done. Perhaps the most criticized and interesting developments are the Agricultural High Schools, types of which may be seen at Ballarat or Wangaratta. To those who visit the country it is specially suggested that they call at some of the one-teacher country schools, so that they may for themselves understand the problems which the Victorian Education Department has to face. The system is administered from Melbourne, and the State is divided into twenty inspectorates, with about 2,000 schools and 5,000 teachers. In the little country schools the individuality of the teacher rapidly comes to light, and nothing in my own experience has been so delightful as a tour through the country in company with members of the staff of the Education Department. It is in these little country schools that one appreciates to the full the manner in which the future citizen and producer of the State is being developed.

The University of Melbourne has developed gradually within the last twelve years. The following figures illustrate the growth, and are taken from a recent report to the University Council of a Committee of Inquiry :—

1.—GROWTH OF THE UNIVERSITY.

The following tables show clearly the growth of the University since 1901 :—

A.—CANDIDATES AT PUBLIC EXAMINATIONS OF THE UNIVERSITY.

	1900-1901.	1911-1912.
Candidates exclusive of Students of Music ..	1,439 ..	3,861
Students of Music	0 ..	1,981

B.—STUDENTS ATTENDING UNIVERSITY LECTURES.

	1901.	1912.
Arts	136	255
Science	17	36
Law	67	130
Medicine	266	376
Engineering	45	66
Music (1902)	105	91
Total	636	954
	Education	112
	Dentistry	67
	Agriculture	28
	Veterinary Science	29
	Architecture	2
*Research	28	
Total .. .. ..	..	266

New
Departments.

Total number of Students including Students in Music and Research Students	636	1,220 ..	1,304	1913.

* In the earlier years Research Students were not enrolled separately, but were admitted to the laboratories subject to the approval of the Professors concerned.

In the older Schools of the University the increase, it will be seen, is from 636 to 954; but, in addition, there are now more than 250 graduates and undergraduates engaged in entirely new departments of professional study.

C.—INCREASE IN TEACHING STAFF.

(Necessitated by increase of Teaching and Research Work.)

	1901.	1912.
Number of Professors	14	18
,, Lecturers	18	55
,, Demonstrators	3	11

GROWTH OF THE UNIVERSITY—*continued.*

D.—INCREASE OF DEPARTMENTS.

			1901.		1912.
Number of Faculties	..	..	3	..	†9
" Main Departments	..	..	6	..	12
" Faculties in which non-Academic Bodies are represented	..	..	1	..	8
.. Main Associations with External Educational Agencies ..	..	..	0	..	3

† This includes the Schools Board, which is virtually a Faculty.

E.—BUSINESS MANAGEMENT.

			1901.		1912.
Expenses of Management ..	..	..	£1,725	..	£2,174
Members of Office Staff ..	..	..	4	..	10

But the University has still much leeway to make up. Its extension system has been inadequate, and it has not influenced the mass of people directly in the way those who best serve it desire, and for this really worldwide difficulty I think some blame must be laid to the attitude of nineteenth century science. The way of the originator and the man of research cannot be controlled with profit, but it would be well if it were once and for all clearly understood that those whose activities take them in the direction of practical affairs are just as likely to be of service to the world, as those whose research turns in a recondite direction ; and that the mental habit of regarding the one type of work as superior to the other is unfortunate to a degree. It ends in a breach, difficult to heal, between the conservator of knowledge and the practical man of affairs. The former is apt to regard the latter as a relatively inferior man engaged in rather commonplace problems. The latter regards the former as a pedant, who does not understand what is required of him. And as the practical man after all finds the wherewithal for research purposes the attitude has been unfortunate. The future relationship, which is in sight, was well indicated by the Minister of Customs, Mr. Groom, when presiding at a University lecture recently. He said that success in the future, in the solution of great national problems, would probably fall to the lot of the scientific man who had in him a dash of the statesman. And we may, with due apology to Mr. Dooley say, that if the statesman had a little knowledge of science, and if the man of science had a little knowledge of statesmanship, it would not make very much difference what the academic attitude was.

By what road then can one proceed to settle the multitudinous problems which have been hinted at in the foregoing pages, and the still more numerous problems which have not even been alluded to—in what manner can solution be effected ? I have no hesitation in making answer. By providing at all costs and hazards large numbers of educated men and women ; by providing all those who show aptitude with the most ample opportunities for effective, thorough, and practical training in technology, or in pure science. I am glad to say that the manufacture is now proceeding much more satisfactorily than in the past. But the methods want reconsideration and modification from time to time. Nothing is more striking than the way in which medical science



CHURCH OF ENGLAND GRAMMAR SCHOOL, MELBOURNE.

has changed its view-point in the last ten years. Under the influence of Flexner, of Starling, and of the German Universities, most progressive clinicians are agreed that the practice of medicine must be intimately and closely associated with the elucidation of its problems by scientific methods and that the process should take place in one building and by the practitioner himself or at least under his direction. In other words that the Professor of Medicine, provided with a salary that puts the necessity of private practice out of the way, should devote his life to the study of medicine, and the elucidation of its problems in the wards of a hospital and the laboratories of a hospital. The same principle may be applied to practically every form of human activity. It is the study of the problems on the spot by men who understand the practice of the occupation, and who are efficiently trained in the methods of science—it is by this procedure, and this procedure alone, that the finest results are likely to be obtained.

It means, however, an enlargement of the conception of the word Science. It means that we must take a far more sympathetic interest in the difficulties of the practical man of affairs. It means that the University must be co-extensive with the State or territory in which it is placed, and that each individual in the State must be encouraged to feel that he can be, and should be, a constituent member of that University.

APPENDIX.

MEMORANDUM BY MR. P. BARACCHI, GOVERNMENT ASTRONOMER FOR VICTORIA, DATED 15TH DECEMBER, 1913.

"Attention may be directed to the following astronomical and geophysical subjects for the advancement of which Australian co-operation is especially required and, indeed, expected by the scientific world, namely:—

- (1) The study of solar physics by modern means and methods.
- (2) The improvement of Australian longitudes.
- (3) A detailed magnetic survey of Australia.
- (4) A general gravity survey of Australia.

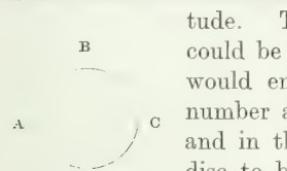
Also for scientific purposes of a more practical character and local importance.

- (5) The efficient control, verification, and preservation of physical standards.
- (6) The introduction of the metric system.

(1) The study of the sun in Australia has been urged by strong appeals to the Governments of the Commonwealth and of the States by the International Union for Solar Research, the British Association, the Royal Society of London, the Smithsonian Institution, and the Australasian Association for the Advancement of Science.

The existing State observatories are unsuitable for this class of work, and the establishment of a new Solar Observatory, at a locality sufficiently elevated above sea-level and possessing satisfactory atmospheric conditions, is required.

The principal reasons in support of this request are stated in a memorandum of the Solar Physics Committee of the Australasian Association for the Advancement of Science, as follows:—"The existence of the International Union for Solar Research is due to the fact that several problems connected with the sun depend for their solution upon a continuous series of observations made throughout the 24 hours, during which period the earth rotates once about its axis, and presents different parts of its surface to the sun. It has thus passed out of the scope of two or even three stations to deal with such questions—what are required are observatories spaced regularly round the earth so that the sun may be observed at one of them when observations are unfavorable or impossible at the others. At present the stations are concentrated in three well defined areas, which are marked A, B, and C in the sketch and which are separated by approximately 90 degrees of longitude.


B C
A D
tude. The great gap between India and America at D could be filled by an Australian observatory whose erection would enable the changes in the form of sun spots, their number and areas, and the variation in the prominences, and in the distribution of metallic vapours over the solar disc to be kept under continuous observation throughout

the whole of the 24 hours. If we neglect Mauritius and Melbourne, where solar work is confined to direct photographs of the sun's disc, no station south of the equator contributes towards the international scheme, though work with the spectro-heliograph is required in southern latitudes, and that most important branch of study—solar radiation—must eventually be undertaken in the same part of the world. For this work a fully-equipped observatory exists at Washington, and, though the Smithsonian Institution has repeatedly urged the necessity of an additional station south of the equator, and has pointed out the benefits that may reasonably be expected from a full study of the subject, the problem is not attacked elsewhere. With her almost perpetual sunshine, Australia is particularly suitable for this work, and, besides the promise that her clear skies give of excellent photographic results, the feature that makes Australian co-operation especially desirable is that observations would be possible in Australia at the time of the year when they can be least successfully made at other great observatories—Kodaikanal (India), Mt. Wilson (U.S.A.), England, &c. At the first of these, the rainy season lasts from November till February, at the second, December till May, and in England work is out of the question during the winter. Consequently an observatory in Australia, where the sunshine is practically unfailing from November till March, is essential for supplying the solar observations for this season of the year, and is necessary for the fulfilment of the scheme of international co-operation."

The council of the Royal Society urges the establishment of a solar observatory in Australia, "especially as the subject includes the connexion between solar changes and meteorological and magnetic phenomena."

At the meeting of the International Union for Solar Research, which was held in Paris in May, 1907, the following resolution was proposed by Sir Norman Lockyer and carried unanimously :—

“ That this International Congress hears with great satisfaction of the proposal to establish a Solar Physics Observatory in Australia, and expresses its decided opinion that an observing station in that part of the world would fill a gap which now exists in the system of observatories distributed over the earth, and yield contributions of great value to the study of solar phenomena.”

The consensus of the scientific world is general that a Solar Observatory in Australia is desirable and deserving the full support of the Government.

Some progress towards the realization of this object has been made by the Government of the Commonwealth, as may be gathered from the following brief statement :—

In February, 1910, at the request of the Department of Home Affairs, a Board, consisting of Messrs. R. McDonald, C. R. Scrivener, R. P. Sellors, H. A. Hunt, and myself, inspected the Federal Territory under instructions to select a locality which offered the best conditions for the purposes of an Astronomical Observatory of the first order, according to modern standards.

This Board selected a site known as Mt. Stromlo, being the highest summit of a group of hills situated some 6½ miles west of the centre of the Federal Capital, and about 2,500 feet above sea-level.

The late James Oddie of Ballarat (Victoria), at the instigation of Dr. J. Duffield (who on behalf of the International Union for Solar Research initiated a vigorous movement in the year 1909 for the establishment of a Solar Physics Observatory in Australia), presented to the Government of the Commonwealth, in the autumn of 1910, a fine 9-inch refracting telescope by Grubb, of Dublin, equatorially mounted.

This instrument was installed at Mt. Stromlo in September, 1911, a small observatory building of concrete, with a 19-feet dome, having by that time been erected and completed for the purpose of receiving it. The object was to determine by actual astronomical observations, extending over at least a year, whether the site was suitable for modern astronomical research, including solar physics. This was done by myself and my chief assistant, Dr. Baldwin, and in June, 1913, I reported to the Commonwealth Government that the site of Mt. Stromlo fulfilled the most essential requirements for any class of delicate astronomical work.

The study of the sun, according to the programme of the International Union for Solar Research, could be efficiently carried on at this site, if the Observatory were properly equipped and manned.

The Commonwealth authorities seem well disposed to expand the Mount Stromlo Observatory, and make it a permanent Astronomical Institution, including a Solar Department, but no further steps have, as yet, been taken.

(2) Australian Longitudes.—We have two Australian meridians which have been independently connected with the prime meridian of Greenwich by two opposite chains of telegraphically-determined longitudes. These are the meridian of Port Darwin, on the north coast, and the meridian of South Port, Queensland, on the east coast of Australia.

The longitude of Port Darwin was determined in 1883 by telegraphic exchange of time signals with Singapore, which latter place had been previously connected telegraphically with Madras.

The longitude of Madras is probably known with the utmost accuracy attainable at present, but the interval Singapore-Madras was measured twice, and the two independent results differed by 0s. 7, and the interval Singapore-Port Darwin was only measured once, and has not been independently checked.

The meridian of South Port (Queensland) is the end of the chain of Trans-Pacific longitudes determined by the Canadian astronomers in 1905, by which it is connected with Greenwich, *via* Canada and the Atlantic Ocean.

The longitude of South Port is probably as accurately known as that of Madras.

These two principal Australian meridians were connected at various times through the observatories of Melbourne and Sydney, thus completing what has been called the Metallic Longitude Girdle round the world.

This Girdle presents five main subdivisions, namely :—

- Greenwich-Madras.
- Madras-South Port (Queensland).
- South Port-Vancouver.
- Vancouver-Montreal.
- Montreal-Greenwich.

The link Madras-South Port is the weak part of the chain. The other four links fulfil the essential conditions for modern determinations of fundamental longitudes.

If the interval Madras-Singapore were efficiently re-measured, the whole Longitude Girdle would be very greatly strengthened, thus forming an harmonious system, and making Indian, Australian, and Canadian longitudes, with their trans-Pacific and trans-Atlantic connexion, comparable and adjustable on a sound plan, acceptable to all concerned.

A re-determination of the longitude intervals Madras-Singapore, Singapore-Port Darwin, and a re-measurement of the Australian Arc Port Darwin-South Port, are strongly recommended.

(3) A magnetic survey of the globe is the aim and the desideratum of modern investigators, and the improvement of our knowledge of terrestrial magnetism depends entirely on the co-operation of every civilized country in obtaining magnetic data from actual observation.

The great Carnegie Institution is using a considerable part of its means and resources towards the accomplishment of this object. Its officers are at work in different parts of the world, and on the Australian continent some 230 magnetic stations have been occupied by them, and the magnetic elements determined at each, thus forming a skeleton magnetic survey of Australia.

It is now urged and expected that a detailed magnetic survey be undertaken by us, so as to complete the task, as far as Australia is concerned. It is well known that this class of work is both of scientific and of practical importance, and it seems desirable that it should be carried out by the State Departments

of Crown lands in each State. It would not be difficult to select two young Government surveyors in each State, who could be trained in magnetic work in a few months, and could gradually extend the magnetic survey while employed in their ordinary field duties.

The equipment of each party could be procured for some hundreds of pounds, and in the course of a few years Australia would be in a position to contribute its valuable share to the advancement of so important a branch of research as that of the distribution of magnetic force over the surface of the globe.

(4) Another physical condition of the earth, in the investigation of which the Governments of several nations have given support, is the variation of the force of gravity.

One of the results to be expected from a gravity survey is the improvement of our knowledge of the figure of the earth. Gravity work has an important bearing on other terrestrial conditions, and its value is enormously increased as the gravity survey of the whole globe is approaching completion.

Australia's contribution towards this branch of knowledge would be especially valuable on account of the isolated position which it occupies in the Southern Hemisphere.

(5) Standards.—In order to secure uniformity throughout the Commonwealth in measurements of all kinds for both scientific and practical purposes, a national institution should be created, combining, in several respects, the functions of the English Board of Trade and the National Physical Laboratory, wherein primary standards of weights and measures should be preserved, and standardizing of all measuring instruments of any kind with the highest scientific efficiency and accuracy obtainable by the best means and methods known at present, should be carried out.

At present each State has its own Acts, which regulate all matters concerning weights and measures; each State has its own standards, which may or may not be of the same degree of accuracy, and verifications of these are probably carried out in different ways. One State Department may verify standards of length, another standards of weights, and measures of capacity; standard thermometers are verified by one institution, hydrometers by another, and, in some cases, there is no Government Department where certain kinds of measuring or testing instruments can be efficiently verified.

A central Commonwealth Bureau of Standards, such as is here proposed, could undertake to supply each State with secondary standards of all kinds, to verify such standards, and to standardize instruments for the public, as well as to maintain under its care all primary measuring standards of the Commonwealth.

(6) The introduction of the metric system in Australia could be considerably facilitated by an institution such as that described above.

In England and America the metric system has not yet been made compulsory, but, long since, these countries found it necessary to introduce appropriate legislation, and to make provisions by which metric weights and measures could be legally used in trade and commerce by any one who desired to do so, subject to the same law which regulates the use of British weights and measures.

Thus, in England, the British Board of Trade was provided, in 1889, with primary metric standards, by which alone all other metric weights and measures in use in the country could be verified and legalized, and a similar provision was made in the United States.

In order to fulfil the essential condition that the values of metric weights and measures be exactly the same in all countries where their use is legally permitted, it is required that the Government concerned be provided with authentic and accurate copies of the only prototype metre and kilogramme which had been accepted by common consent as the fundamental standards of the metric system.

These fundamental standards were constructed by the International Committee of Weights and Measures which was established under a Metric Convention, dated 20th May, 1875, signed by twenty high contracting States, exclusive of Great Britain, which finally joined the convention in September, 1884.—(H. J. Chaney, "Standard Weights and Measures in the British Empire.")

The International Committee of Weights and Measures has its Bureau at Sevres, near Paris, and is the accepted official authority by which all primary State standards of the metre and kilogramme are issued to every part of the world. This institution is maintained by contributing countries, which now include England and America, by the payment of a variable annual sum, computed *pro rata* of their respective populations, so as to provide a fixed total amount of £4,000 per annum, but the annual contribution of any contracting country cannot be less than £20. New countries now wishing to join are to pay also an entrance duty of about £56 16s. per million of population, with the condition that the entrance duty for any State is not to be less than about £116.

The cost of joining the Metric Union, computed for the Commonwealth, would be approximately as follows:—

Entrance duty	£235
Annual contribution	£34

It is urged that there is sufficient justification for recommending the Government of the Commonwealth to come into line with England and America in this matter, by joining the International Committee as one of the contributing countries, and then to proceed to make arrangements for the acquisition of the requisite primary standards, comparators, &c., and eventually to legalize them by appropriate legislation. The cost of the required standards, &c., may be estimated at £1,350.

A Metrical Department could be set up at the Federal Capital, with the equipment obtainable for this sum, which would be probably sufficient for all official purposes for several years."



VICTORIA'S POPULATION.

By A. M. Laughton, F.I.A., F.F.A., Victorian Government Statist.

Victoria is the smallest of the five States on the continent of Australia, of which it occupies the south-eastern portion. It is bounded on the north and north-east by the State of New South Wales, and on the west by the State of South Australia. On the south and south-east its shores are washed by the ocean. It lies between the 34th and 39th parallels of south latitude, and the 141st and 150th meridians of east longitude. Its extreme length from east to west is about 420, its greatest breadth about 250, and the length of its coast line nearly 600 geographical miles. Its area is 87,884 square miles, or 56,245,760 acres—about a thirty-fourth part of that of the continent of Australia. The area of England, Wales, and Scotland, exclusive of islands, is about 88,309 square miles, and is therefore slightly greater than that of Victoria.

In the sixteenth and seventeenth centuries, Portuguese, Spanish, and Dutch navigators touched at various points on the Australian coast, but the settlement of Australia by a white race under the British Crown is due to the enterprise, skill, and courage of Captain James Cook. In 1768 the British Government sent a scientific expedition, under his command, to Tahiti, with permission to undertake exploration in the South Seas. Cook first landed in New Zealand at Poverty Bay, on 8th October, 1769.

Discovery of Australia by European Navigators. After coasting round the North Island, and the South and Stewart Islands, he took his departure from Cape Farewell on the 31st March, 1770, for Australia, and on the 19th April, 1770, land was sighted by Lieutenant Hicks, at a point believed to be the present Cape Everard, on the Victorian coast. Cook sailed northwards, and, after seven or eight days on the water, landed first at Botany Bay, then further north at other places on the east coast. He then passed through Torres Strait, and, having thus demonstrated the fact that Australia was an island (although believed to be joined to Van Diemen's Land), returned home. On his return to England, Cook reported Botany Bay to be a suitable place for colonization, and this led to a party of convicts being despatched there in 1788 under Captain Arthur Phillip, R.N.

The first landing known to have been effected in Victoria was in 1797, from a vessel wrecked on Furneaux Islands, in Bass Strait. Mr. Clarke, the supercargo, and two sailors, or three out of a total of seventeen, reached Sydney overland, and these were probably the first white men who landed on Victorian shores.

First Landing in Victoria by White Men. Notable discoveries by sea were afterwards made by Flinders, Bass, Grant, Murray, and others, the first of whom sailed through the strait separating Australia from Van Diemen's Land, and circumnavigated the latter island, thus proving its insularity. In 1802 Port Phillip Bay was discovered by Lieutenant Murray, who was sent from Sydney in the *Lady Nelson* to survey the south coast.

In 1803 an attempt was made to colonize Victoria, then known as the territory of Port Phillip, by making it a convict colony, which, luckily, proved abortive. A penal expedition, under Captain Collins, arrived in Port Phillip Bay on 7th October. It consisted of nearly 400 persons, of whom over 300 were convicts. A sandy site, chosen at Sorrento, near the

entrance to Port Phillip Bay, proved to be unsuitable for the colony, chiefly because of the scarcity of fresh water, and Collins sent out an exploring party in search of a better place. The hostility of the blacks, preventing any satisfactory land exploration, and stormy weather in the bay, precluding efficient observation, combined to produce a gloomy

Early Attempts at Colonization. report, and Collins applied to his chief at Sydney for permission to remove to Van Diemen's Land. Governor King readily assented, and, after three months of wretchedness in Port Phillip, the colony crossed Bass Strait, and founded the settlement at the Derwent. Among the few children who had accompanied their parents in this expedition was John Pascoe Fawkner, who, 32 years later, led a party to the Yarra, and assisted in the foundation of Melbourne.

In 1824 a young Australian-born explorer, Hamilton Hume, of Lake George, in company with Captain Hovell, and with six convicts as servants, set out overland with the intention of reaching Westernport. After accidents by flood and field, swimming rivers, climbing mountains, and hewing their way with difficulty through rough forest country, they reached the river which now separates Victoria from New South Wales, and which they called the Hume. After much toil and many disappointments they reached Corio Bay, near the site of the present town of Geelong. The members of the expedition, believing that they had reached their destination, then returned to Sydney. Two years later another expedition, under Captain Wright, with Hovell as guide, settled at Westernport, the latter being under the impression that this was an inlet of the bay which Hume and he had previously reached. After a year's struggle for existence the place was abandoned and the settlement withdrawn, lack of energy and general discontent being the apparent causes of failure.

As early as 1828 sealers had erected temporary dwellings upon suitable spots on the southern coast of Victoria. The principal traders were William Dutton, John Griffiths, and John and Charles Mills, the first-named of whom established a whaling station in Portland in 1832.

The first permanent settlement in Victoria was formed at Portland Bay by Mr. Edward Henty, from Van Diemen's Land—as Tasmania was then called—who landed on the 19th November, 1834, and soon commenced to till the soil, breed stock, and carry on whaling operations. Others followed, but the absence of good land in the immediate vicinity of the port, and the openness of the bay, which rendered it unsafe for shipping

First Permanent Settlement. during the prevalence of certain winds, caused it to be considered an unsuitable site for a capital. This was eventually founded at the northern end of Port Phillip Bay by two parties—one led by John Batman, who landed on the 29th May, 1835, and the other by John Pascoe Fawkner, whose party arrived at the site of Melbourne on the 28th August of the same year. Both of these were from Van Diemen's Land, and they were soon followed by others from the same island and from Sydney, who brought stock with them, and commenced to push their way into the interior. These were met by Major (afterwards Lieutenant-Colonel Sir) Thomas Mitchell, who, entering from New South Wales on the north, and traversing a considerable portion of the

as yet, unknown territory, was so struck with its wonderful capabilities that he named it Australia Felix—a title, the aptness of which, a subsequent knowledge of the geniality of its climate, the excellence of its soil, and the then unsuspected richness of its mineral treasures, has proved to be fully justified.

The reports of Sir Thomas Mitchell, and the success of the first settlers, caused great excitement, not only in the Australian settlements, but in the mother country. Herds of cattle and sheep, driven overland from New South Wales, speedily occupied the best parts of the new territory. Every available craft capable of floating was put into requisition to bring passengers and stock from Van Diemen's Land, and after a time shiploads of immigrants began to arrive from the United Kingdom. Regular government was first established under Captain William Lonsdale, who, having been sent from Sydney to take charge of the district, landed on the 29th September, 1836; and on the 2nd March of the following year Sir Richard Bourke, the Governor of New South Wales, visited it, and named the metropolis Melbourne.

According to manuscript notes made by Captain Lonsdale (afterwards the first Colonial Secretary of Victoria), the first enumeration of the people of the State was made within a year after the arrival of Batman (29th May,

**First
Enumeration
of People.** 1835) by an officer from Sydney named George Stewart, who came in the revenue cutter *Prince George* with orders from His Excellency Sir Richard Bourke to report upon the state of things in the new district. It was then found (25th May, 1836) that the band of first arrivals consisted of 142 males and 35 females, or, in all, 177 residents of European origin. This was the first official census of what was at that time known as Port Phillip. The settlers came from Tasmania and New South Wales.

The second enumeration was made on the 8th November of the same year (1836) by order of Captain Lonsdale, who on the 29th of the previous September arrived in H.M.S. *Rattlesnake* (Captain Hobson), which anchored in that part of the port now called Hobson's Bay. Captain Lonsdale had been appointed police magistrate, with instructions to take general charge of the district. On the 5th October the *Stirlingshire* (brig) arrived with the remainder of the Government establishment, consisting of a detachment of Captain Lonsdale's regiment (the 4th), a principal officer of Customs, three surveyors, an officer in charge of commissariat stores, a small number of Crown prisoners for public service, and three constables. Notwithstanding these additions to the population, the census of the following month showed an increase of 47 persons only, making a total of 224 persons (186 males and 38 females). The third census was taken nearly two years after, in September, 1838, when it was ascertained that the number of inhabitants had increased to 3,511, and at the end of 1840 it was estimated that the Port Phillip district contained 10,291 persons. During each of the years 1840 and 1841 the population doubled itself, owing principally to the number of assisted immigrants who arrived in the district, and good progress continued to be made to the end of 1850, when the community numbered 76,162 persons.

The discovery of gold in 1851, however, was the greatest factor in populating Victoria. When the discovery was announced, diggers came in thousands from New South Wales, South Australia, and Tasmania, and later on crowds of emigrants from the United Kingdom and other European

countries joined in the rush. America contributed its quota too, even Californians leaving their own gold-bearing country to try their fortunes in

Effect of Gold Discoveries. Australia. Some idea of this influx may be gathered from the official figures, which show that the population numbered 463,135 at the end of 1857, or more than six times that of 1850. During the decade 1861 to 1871, the population increased by 191,206, all but 41,789 of which was due to the excess of births over deaths. In the next decennial period, 1871 to 1881, there was an increase of 130,818, but this would have been 15,000 greater if the arrivals in had equalled the departures from the colony.

Between 1881 and 1891 an addition of 278,059 was made to the population, about 117,000 of this being due to immigration. The latter portion of this decennium is known as the "boom period," when land values were highly inflated, wages and prices were at a maximum, and expenditure by the

Effect of Land Boom. Government and the people generally was conducted in a most lavish manner. The inevitable reaction followed, and this is reflected in the records. The net migration from the State during the ten years following 1891 amounted to 111,848 persons, the increase of 60,665 in the total population being accounted for by the fact that the births exceeded the deaths by 172,513. Most of the emigrants left for Western Australia, where gold had been discovered in large quantities.

In 1902-3 a year of unexampled drought was experienced which was felt severely by Victoria, as well as all the other eastern States. **Progress in Recent Years.** Since then good seasons have followed one another almost without intermission, with the result that employment has been plentiful, and that the State has not only been able to retain its own people, but also to attract others from outside in increasing numbers.

The subjoined table contains a statement of the population of the State in various years from 1836 to 1912:—

ESTIMATED POPULATION OF VICTORIA, 1836 TO 1912.

Year.	Estimated Population, 31st December.			Estimated Mean Population.
	Males.	Females.	Total.	
1836 (25th May) ..	142	35	177	200
1836 (8th November) ..	186	38	224	
1840	7,254	3,037	10,291	8,056
1850	45,495	30,667	76,162	71,191
1855	234,450	129,874	364,324	338,315
1860	328,251	209,596	537,847	534,055
1870	398,755	327,844	726,599	713,195
1880	451,456	408,611	860,067	850,343
1890	596,064	537,202	1,133,266	1,118,500
1900	602,487	594,719	1,197,206	1,193,338
1901	610,005	602,608	1,212,613	1,204,909
1902	609,246	606,594	1,215,840	1,214,226
1903	607,092	608,110	1,215,202	1,215,521
1904	607,285	611,323	1,218,608	1,216,905
1905	612,488	616,497	1,228,985	1,223,796
1906	620,125	624,349	1,244,474	1,236,729
1907	627,631	632,837	1,260,468	1,252,471
1908	633,104	637,993	1,271,097	1,265,782
1909	643,642	647,377	1,291,019	1,281,058
1910	652,285	655,826	1,308,111	1,299,565
1911	668,258	669,420	1,337,678	1,321,212
1912	685,895	689,186	1,375,081	1,354,319

Elements of Increase in Population.

The excess of births over deaths and the extent to which the arrivals exceeded or fell short of the departures in the six decennial census periods from 1851 to 1911, and in the period from April, 1911, to the end of 1912, are shown in the table which follows :—

Period.	Excess of Births over Deaths.	Excess of Arrivals over Departures	Excess of Departures over Arrivals.	Increase of Population.
1851–61	62,932	400,045	..	462,977
1861–71	149,417	41,789	..	191,206
1871–81	146,140	..	15,322	130,818
1881–91	161,109	116,950	..	278,059
1891–1901	172,513	..	111,848	60,665
1901–11	156,821	..	42,340	114,481
1911–12 (1½ years)	32,360	27,170	..	59,530

The average annual rates at which the population has increased
Rate of Increase, 1850–1912. (1) in the whole State, (2) in Melbourne and suburbs, and (3) in remainder of State, are shown hereunder :—

AVERAGE ANNUAL RATES OF INCREASE OF POPULATION.

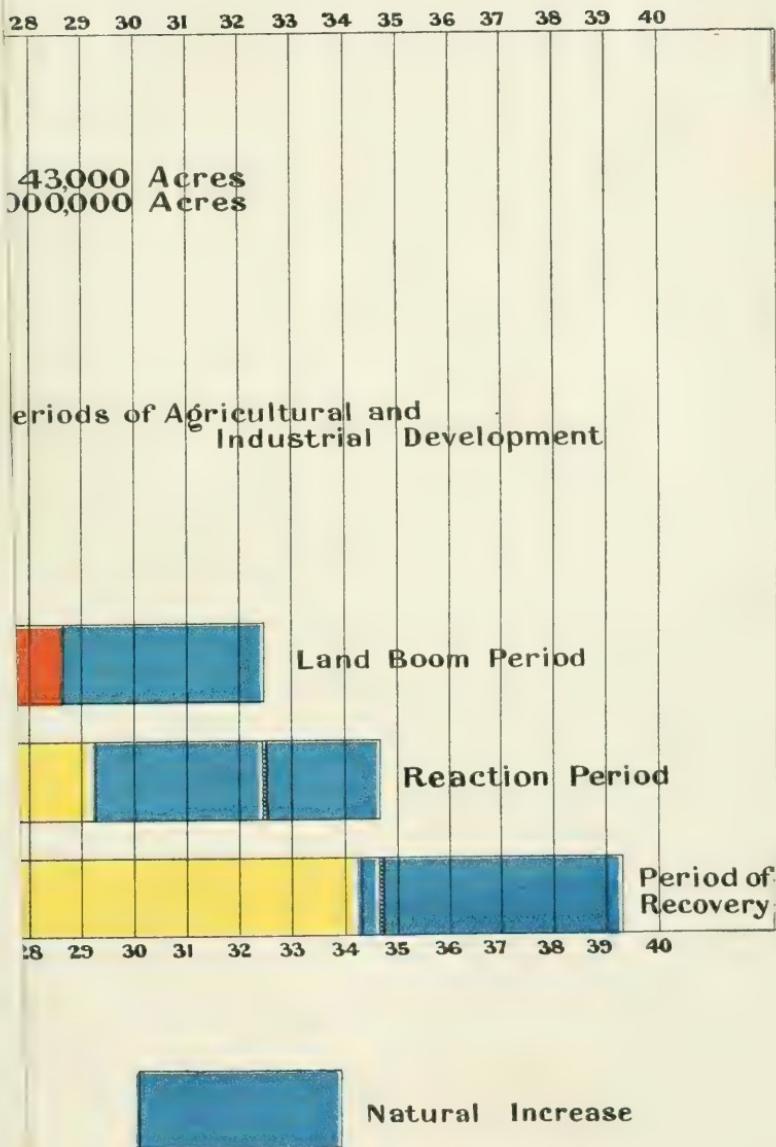
Period.	In Victoria.		In Melbourne and Suburbs.		In Remainder of State.	
	Rate of Natural Increase.	Rate of Total Increase.	Rate of Natural Increase.	Rate of Total Increase.	Rate of Natural Increase.	Rate of Total Increase.
1850–60	2·01	21·59	*	13·62	*	26·67
1860–70	2·46	3·05	1·96†	3·91	2·63†	2·74
1870–80	1·87	1·70	1·33	3·31	2·11	1·01
1880–90	1·66	2·80	1·53	5·56	1·74	1·17
1890–1900	1·47	.55	1·36	.25	1·55	.77
1900–05	1·23	.52	1·00	.99	1·38	.19
1906	1·27	1·26	1·02	2·06	1·46	.67
1907	1·35	1·28	1·14	2·35	1·51	.49
1908	1·22	.84	1·02	2·62	1·37	– .51
1909	1·35	1·56	1·16	2·85	1·49	.56
1910	1·29	1·31	1·07	2·57	1·47	.30
1911	1·36	2·26	1·18	2·07	1·51	2·42
1912	1·44	2·80	1·38	4·71	1·49	1·24

* Not available.

† Average 1862–1870.

It will be observed that the rate of natural increase (excess of births over deaths) has at all periods been less in Melbourne than in other portions of the State, while the rate of total increase has usually been greater. It would appear from this that the metropolis has been gaining population at the expense of the country districts. The higher rate of natural increase in extra-metropolitan areas is due principally to the low death rates there prevailing, and this favorable mortality can only be partially accounted for by the migration from country to town of persons in indifferent health. The greater vitality in country districts shows the advantage to be derived from a large increase in the population of these portions of the State.

1836 TO 1912

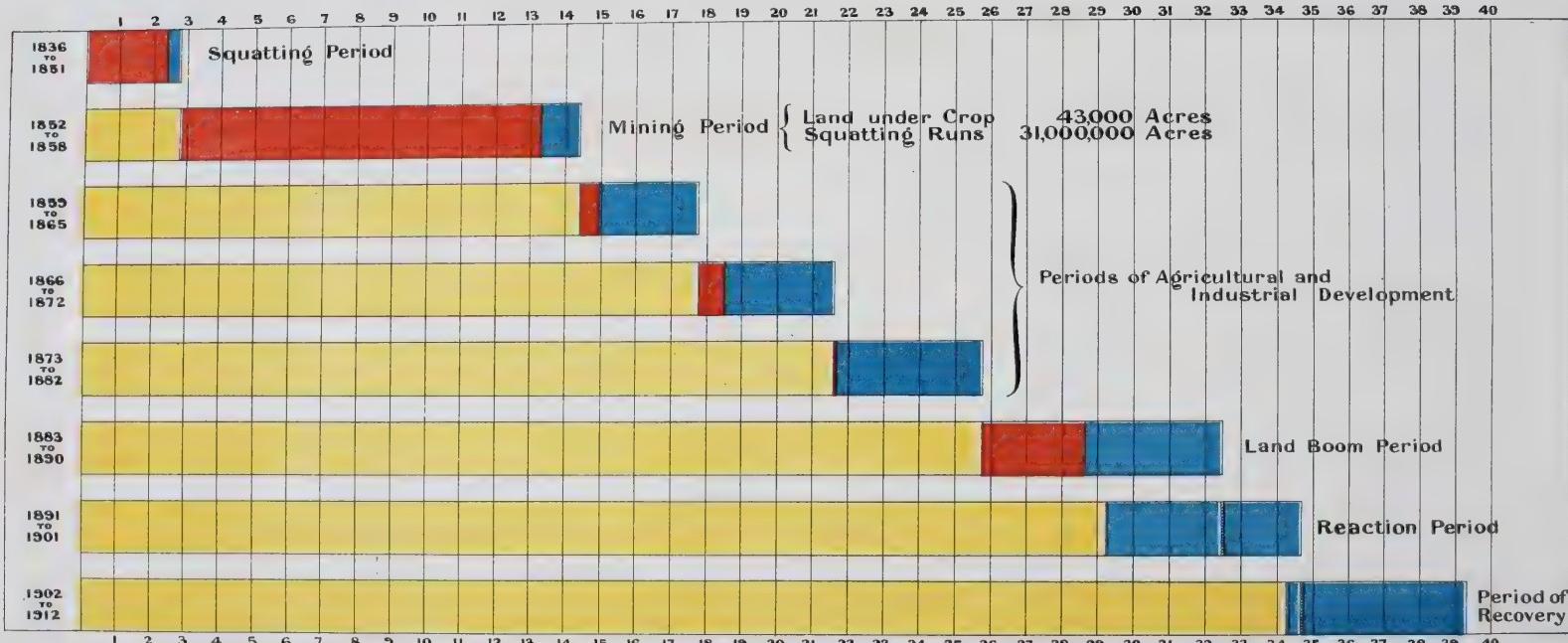


periods, part of the Natural Increase is placed on the
t gain each year by Immigration.

J. H. Mc Donogh

MOVEMENT OF POPULATION IN VICTORIA 1836 TO 1912

Scale :- Each space represents 35,000 persons



Population at beginning of Period ,

Net Immigration ,

Natural Increase

The population of the first period consists only of Immigrants and Natural Increase.

Population at the end of each of the periods is identical with that at beginning of the period below it. But, in the last two periods, part of the Natural Increase is placed on the left of the dotted lines, in order to make good the net loss by Emigration. From 1909 to 1912 inclusive, there was a net gain each year by Immigration.

A diagram, which accompanies this article, shows the increases of population in the State in successive periods and the sources from which these increases were derived.

The population of Victoria (excluding Aborigines) on 31st March, 1901, when the census of that year was taken, was 1,201,070. By the date of

Rate of Increase, 1901-1913. the next census—2nd April, 1911—it had increased to 1,315,551, or by 114,481 persons. The smallness of the increase was due to a severe drought and other adverse conditions which prevailed during the early years of the decennium. The increase for the period from 31st December, 1905, to 2nd April, 1911—five and a quarter years—was 86,566, or about three-quarters of the total for the ten years.

Since the date of the last census, there has been a marked improvement in the rate of increase. Between 2nd April, 1911, and 30th June, 1913, i.e., in two and a quarter years, there was an addition of 74,830 persons, or 65 per cent. of the total addition for the ten-year period 1901-11. If the rate of increase which has prevailed since the census date is continued, there will, by the date of the next census in 1921, be a population of nearly 1,700,000 persons. This cannot be considered as a forecast, as the factors which contribute to increases are too variable in their nature to allow of estimates being made some years in advance.

The following statement shows the recorded net immigration to Victoria by sea from places outside Australia during the years 1901-1912:—

NET IMMIGRATION TO VICTORIA FROM PLACES OUTSIDE AUSTRALIA.

Year.	United Kingdom.	South Africa.	New Zealand and South Seas.	Other British Possessions.	Foreign Ports.
1901	3,083	1,070	-564	1,101	1,442
1902	-253	-1,245	-2,595	125	1,294
1903	-178	-2,717	-2,830	-187	330
1904	-432	200	-2,314	-85	152
1905	15	118	-1,581	-31	64
1906	26	504	-2,332	-62	74
1907	371	1,518	-574	-14	179
1908	855	567	-1,788	200	324
1909	1,419	-112	283	161	460
1910	3,217	-331	174	99	256
1911	8,563	-332	895	133	685
1912	18,756	130	631	194	2,124

NOTE.—The minus sign (—) indicates a loss by emigration.

Prior to 1851—the year when gold was discovered—the population of Victoria was very small, and the survivors of that period represent only a minute proportion of the total present population. For practical purposes,

Ages of the People. therefore, it may be considered that the colonization of the State dates from the year mentioned. The time which has since elapsed is scarcely sufficient to enable the population to attain the same conditions with regard to age distribution as prevail in the countries of the old world; it is certainly not sufficient in the

case of the native-born population. It has further to be remembered that there is a constant efflux of persons in the prime of life from the older to the newer countries, which has the effect of swelling the proportionate numbers living at the younger ages in the latter countries. In Victoria this feature has been counterbalanced, in part, if not entirely, by large numbers of persons having left the State on two or three occasions for other States or countries which at the time appeared to offer superior attractions.

The following table shows the proportions which the persons living at various age periods bore to the total population at the last three census enumerations. Persons of unspecified ages have been omitted:—

AGE DISTRIBUTION OF MALES AND FEMALES AT CENSUSES 1891, 1901, AND 1911.

Age Group.	1891.		1901.		1911.	
	Males.	Females.	Males.	Females.	Males.	Females.
Proportions per cent.						
0-10	23·54	25·33	23·09	22·77	21·26	20·47
10-20	19·38	21·31	21·01	21·22	20·14	19·85
20-30	21·20	21·71	15·97	18·55	17·44	18·42
30-40	13·32	12·24	15·53	15·36	13·22	14·21
40-50	7·72	7·57	10·19	9·29	12·81	12·34
50-60	7·53	6·56	5·60	5·50	7·88	7·29
60-70	5·23	3·70	5·16	4·72	3·87	4·10
70-80	1·74	1·30	2·91	2·11	2·55	2·58
80 and over	·34	·28	·54	·48	·83	·74
All ages	100·00	100·00	100·00	100·00	100·00	100·00

For the sake of comparison, similar particulars are given for England and Wales. These relate to the Census of 1901, as the information is not available for a later date:—

AGE DISTRIBUTION OF MALES AND FEMALES IN ENGLAND AND WALES. 1901.

Age Group.	Proportion per cent. for—	
	Males.	Females.
0-10	22·85	21·49
10-20	20·84	19·70
20-30	17·81	18·72
30-40	13·94	14·19
40-50	10·54	10·51
50-60	7·21	7·43
60-70	4·40	4·93
70-80	1·96	2·39
80 and over	·45	·64
All ages	100·00	100·00

It will be seen that there is a fairly close agreement between the Victorian proportions for 1911 and the English proportions for 1901.

Inhabitants—Length of Residence in Australia. The great majority of persons now living in Victoria have been born in Australia. Of those recorded at the last census date, 84 per cent. were Australian born, and of those born elsewhere only 20,630 had been living in the State for less than five years. In the table which follows, the population enumerated at that census is grouped according to the length of time during which the persons composing it had resided in the continent:—

Length of Residence in Australia.		Males.	Females.	Persons.
0- 5 years	13,498	7,132
5-10	3,466	2,177
10-20	9,107	5,276
20-30	27,339	17,469
30-40	12,202	8,232
40-50	13,864	14,616
50-60	22,762	24,348
60-70	3,058	3,480
Over 70 years	414	479
Unspecified	8,222	9,465
Australian born	541,659	567,286
Total	655,591	1,315,551

The numbers opposite the periods 20 to 30 years and 50 to 60 years are large relatively to those at other periods, owing, in great measure, to the influx of immigrants which took place during the occurrence of a land boom in the late eighties, and after the great gold discoveries in the fifties of last century.

Inhabitants—Birthplaces. The number of persons living in the State who are not of British origin is very small. In 1911 there were only 21,252 persons who were born in countries outside the British dominions, or 1·6 per cent. of the total population. Of the population at that date—1,315,551—77 per cent. were born in Victoria, 8 per cent. in other Australian States and New Zealand, 7 per cent. in England and Wales, 2 per cent. in Scotland, and 3 per cent. in Ireland. Of the females only 7 per cent. were born in other than British countries.

The birthplaces of the persons residing in the State in April, 1911, are given in the following statement:—

BIRTHPLACES OF THE PEOPLE OF VICTORIA, 1911.

Birthplace.		Males.	Females.	Total.
Victoria	495,490	514,729
Other Australian States	46,169	52,557
New Zealand	4,968	5,099
England and Wales	49,558	39,824
Scotland	14,200	12,377
Ireland	19,169	22,308
British India	1,179	427
Other British Possessions	2,201	1,723
Total British	632,934	649,044
				1,281,978

BIRTHPLACES OF THE PEOPLE OF VICTORIA, 1911—*continued.*

Birthplace.	Males.	Females.	Total.
Germany ..	4,343	1,799	6,142
Italy ..	1,140	359	1,499
Sweden ..	1,138	82	1,220
Norway ..	726	81	807
Russia ..	777	296	1,073
United States ..	1,085	665	1,750
China ..	4,246	56	4,302
Other Foreign Countries ..	3,347	1,112	4,459
Total Foreign ..	16,802	4,450	21,252
At Sea ..	630	673	1,303
Unspecified ..	5,225	5,793	11,018
Grand Total ..	655,591	659,960	1,315,551

Number of Coloured Persons.

At the date of the last census there were 7,184 coloured persons in Victoria (exclusive of Aborigines), as shown below:—

NUMBER OF PERSONS OF COLOURED RACES (EXCLUSIVE OF ABORIGINES) IN VICTORIA AT THE CENSUS OF 1911.

Race.	Males.		Females.		Total.	
	Full-blood.	Half-caste.	Full-blood.	Half-caste.	Full-blood.	Half-caste.
Asiatic—						
Chinese ..	4,491	465	216	429	4,707	894
Hindus ..	720	73	9	32	729	105
Japanese ..	39	13	8	7	47	20
Syrians ..	244	11	197	5	441	16
Cingalese ..	14	1	1	3	15	4
Other ..	31	8	2	9	33	17
African—						
Negroes ..	44	27	11	36	55	63
Other ..	3	..	..	..	3	..
American—						
American Indians ..	3	1	..	1	3	2
Other ..	3	3	..	4	3	7
Polynesians—						
Maoris ..	5	2	2	2	7	4
Other ..	2	..	3	1	5	1
Indefinite ..	1	2	..	..	1	2
Total ..	5,600	606	449	529	6,049	1,135

At the first colonization of Victoria the Aborigines probably numbered about 15,000, though the official record gave a much smaller number. When the colony was separated from New South Wales in 1851, the number was officially stated to be 2,693. At the 1911 census there were enumerated 643 aborigines, consisting

Number of Aborigines.

of 196 of pure blood, and 447 half-castes. The race appears to be gradually but surely dying out. A fair proportion of the pure race and half-castes is under the care of the Aborigines Board in the following mission stations :—

NUMBER OF ABORIGINES UNDER CARE AT MISSION STATIONS IN
VICTORIA, 1911-12.

Station.			Area of Reserves.	Total Number under Care.
Coranderrk	..	..	2,400	66
Lake Condah	..	..	2,050	61
Lake Tyers	..	..	4,000	89
Framlingham	..	..	548	18
Colac and Lake Moodemere	..	..	41	6
Depôts	..	..	..	29
Total	..	..	9,039	269

Of the Aborigines not enumerated in the table, some are residing elsewhere than at the mission stations, but receive supplies of food and clothing when they call, while others prefer to lead a wandering life, and but rarely come under the notice of the Board.

Of the coloured races the Chinese are by far the most numerous. They first began to arrive in the State in 1853, and, at the census of 1854, 2,373 were enumerated. In 1857, when the next census was taken, they had increased to 25,424, and at the end of 1859 it was estimated that they numbered no less than 42,000. Soon afterwards an exodus took place, and since 1861 there has been a continuous decrease in the Chinese

population. At the census of 1901 they reached a total of 7,349, and at the census of 1911 they numbered only 5,601 (including 894 half-castes). The Chinese Immigra-

Number of Chinese. *Restriction Act* passed in December, 1888 (afterwards the *Chinese Restriction Act* 1890) was largely instrumental in later years in limiting the number of immigrants. This Act provided that no vessel having on board more than one Chinese to every 500 tons of her burden should enter any port in the State, and that, in the event of any vessel bringing more than this proportion, her owner, master, or charterer would be liable to a penalty of £500 for every one by which it should be exceeded; also that any Chinese who should enter Victoria by land should obtain a permit in writing from an officer duly appointed to grant it, and, failing to do so, should be liable to a penalty ranging from £5 to £20. Under the Immigration Restriction Act of the Commonwealth the practice is not to permit the landing of Chinese, unless they pass the prescribed dictation test, or hold permits dispensing with that condition.

Under the State Act Chinese were allowed to take out letters of naturalization, but owing to the large increase in such applications, 1,178 of which were granted in 1885, it was decided in 1886 to issue no more "unless a sufficient reason was assigned," with the result that only 173 were issued in 1886, and 16 in 1887. None have been granted since the latter date.

The number of persons naturalized in Victoria from 1871 to 1912 was 12,314, of whom about 32 per cent. were Germans, and 24 per cent. Chinese.

Persons Naturalized. There were on 2nd April, 1911, 428,215 persons, or 32½ per cent. of the population, in the marriage state. The wives numbered 216,465, and the husbands 211,750.

The single males of twenty years and upwards, and the single females of seventeen years and upwards, or, in other words, the bachelors and spinsters, numbered respectively 152,753 and 171,514. If to these be added the widowers, widows, and divorcees, it will be found that the whole marriageable population at the census was 173,148 males and 219,694 females, the latter thus exceeding the former by 46,546. At the census, therefore, the marriageable females were in the proportion of 127 to every 100 marriageable males. In 1901 the proportion of females was 117; in 1891, 88; in 1881, 89; and in 1871 only 52.

Number of Marriageable Males and Females. The masculinity of the population, or the ratio of males to females, at the last six census enumerations, was as follows:—

MASCULINITY OF POPULATION, 1861 TO 1911.

	Year.	Males to 100 Females.
1861	155·26
1871	121·36
1881	110·19
1891	110·41
1901	101·08
1911	99·34

These proportions relate to the population as a whole. The ratios for different age groups for the last three census years are given below:—

RATIOS OF SEXES AT DIFFERENT AGES, CENSUS YEARS 1891, 1901, AND 1911.

Age Group.	Males to every 100 Females.		
	1891.	1901.	1911.
0-10 ..	102·5	102·3	103·2
10-20 ..	100·3	99·9	100·9
20-30 ..	107·8	87·0	94·2
30-40 ..	120·0	102·0	92·5
40-50 ..	112·3	110·6	103·2
50-60 ..	126·5	102·9	107·3
60-70 ..	155·9	110·4	93·9
70-80 ..	147·8	139·1	98·7
80 and over ..	134·8	114·7	110·3
Total ..	110·4	101·1	99·3

These figures show that while the ratio of males to females has varied at successive census enumerations, it has generally shown a tendency to decline.



TYPES OF VICTORIAN NATIVES—GIRLS AT PHYSICAL DRILL.

The proportion of males to females is smaller in Victoria than in any other part of Australasia, but it is greater than in England and Wales. This will be apparent from the following figures :—

PROPORTION OF SEXES IN AUSTRALIA, NEW ZEALAND, AND ENGLAND AND WALES, 1911.

Country.	Males per 100 Females.
Victoria	99·34
New South Wales	108·71
Federal Capital Territory	137·40
Queensland	119·26
South Australia	103·06
Northern Territory	474·61
Western Australia	134·03
Tasmania	104·24
Australia	107·98
New Zealand	111·61
England and Wales	93·67

Melbourne, the capital city of Victoria, had an estimated population at the end of 1912 of 628,430 persons (296,580 males and 331,850 females), or of nearly 46 per cent. of the population of the whole State. In all the urban districts, including Melbourne, it was estimated that there were at that date 845,180 persons, or over 61 per cent. of the total for the State. The statement which follows shows the metropolitan, urban, and rural populations along with the number of persons to the square mile :—

URBAN AND RURAL POPULATION.

Division.	Estimated Area in Square Miles.	Estimated Population, 31st December, 1912.		
		Total.	Proportion per cent.	Persons to the Square Mile.
Metropolitan	255	628,430	45·70	2,464
Other Urban	376	216,750	15·76	576
Total Urban	631	845,180	61·46	1,339
Rural	87,253	529,901	38·54	6·1
Total State	87,884	1,375,081	100·00	15·6

Outside Melbourne and suburbs there are 24 towns in the State, which at the end of 1912 contained a population of 3,000 or over. Their estimated populations are given below:—

Name of Town	Estimated Population, 1912.	Name of Town.	Estimated Population, 1912.
Ballarat	42,004	St. Arnaud	3,800
Bendigo	39,170	Echuca	3,546
Geelong	31,235	Wangaratta	3,500
Castlemaine	7,212	Camperdownd	3,473
Warrnambool	7,100	Beechworth	3,420
Maryborough	5,600	Sale	3,420
Hamilton	5,000	Bairnsdale	3,412
Mildura	4,700	Horsham	3,400
Stawell	4,500	Wonthaggi	3,300
Ararat	4,300	Kyneton	3,174
Colac	3,992	Maldon	3,077
Daylesford	3,846	Shepparton	3,000

A convenient method of showing the distribution of the population throughout the State is to give the population of each county. This is done in the following statement:—

POPULATION OF COUNTIES IN VICTORIA AT CENSUS OF 1911.

Districts and Counties.	Males.	Females.	Total.
Central—			
Bourke (including Melbourne)	295,309	327,502	622,811
Grant	34,991	36,486	71,477
Mornington	19,034	16,279	35,313
Evelyn	9,026	8,265	17,291
North-Central—			
Anglesey	4,772	4,180	8,952
Dalhousie	8,917	8,724	17,641
Talbot	23,567	24,364	47,931
Western—			
Grenville	20,503	22,567	43,070
Polwarth	7,367	6,533	13,900
Heytesbury	3,705	3,261	6,966
Hampden	6,707	6,188	12,895
Ripon	7,464	6,448	13,912
Villiers	11,430	11,297	22,727
Normanby	5,900	6,007	11,907
Dundas	5,298	5,152	10,450
Follett	1,372	1,339	2,711
Wimmera—			
Lowan	7,082	6,231	13,313
Borung	16,289	14,562	30,851
Kara Kara	8,265	7,274	15,539
(These three counties are situated to the north of the "Western" counties).			
Mallee—			
Millewa	56	28	84
Weeah	1,255	697	1,952
Karkarooc	9,618	6,562	16,180
Tatchera	6,318	4,519	10,837
(These four counties are in the north-west of the State).			

POPULATION OF COUNTIES IN VICTORIA AT CENSUS OF 1911—*continued.*

Districts and Counties.					Males.	Females.	Total.
Northern—							
Gunbower	..	..	..	..	5,083	4,181	9,264
Gladstone	..	..	..	..	8,752	7,961	16,713
Bendigo	..	..	..	..	26,771	27,729	54,500
Rodney	..	..	..	..	10,399	9,089	19,488
Moira	..	..	..	..	16,814	15,028	31,842
North-Eastern—							
Delatite	..	..	..	..	11,491	10,574	22,065
Bogong	..	..	..	..	14,681	13,224	27,905
Benambra	..	..	..	..	3,625	2,957	6,582
Wonnangatta	..	..	..	..	998	733	1,731
Gippsland—							
Croajingolong	..	..	..	..	1,510	1,190	2,700
Tambo	..	..	..	..	1,650	1,329	2,979
Dargo	..	..	..	..	3,077	2,441	5,518
Tanjil	..	..	..	..	10,130	9,562	19,692
Buln Buln	..	..	..	..	22,283	18,774	41,057
(These five counties are in the south-east of the State).							
Outside Counties—							
Shipping	..	..	..	..	4,082	723	4,805
Total	..	..	..	..	655,591	659,960	1,315,551

Comparison with other States and New Zealand.

The next table contains the populations of each of the States and New Zealand and of the different capital cities, and shows the number of persons to the square mile and acre respectively :—

POPULATION OF EACH AUSTRALIAN STATE AND NEW ZEALAND, AND OF ITS CAPITAL CITY, 1912.

State.	Estimated Population, 1912.	Persons to the Square Mile.	Capital City.	Estimated Population, 1912.	Persons to the Acre.
Victoria ..	1,375,081	15·65	Melbourne ..	628,430	3·84
New South Wales ..	1,777,534	5·74	Sydney ..	694,800	7·29
Queensland ..	636,425	.95	Brisbane ..	145,022	.74
South Australia ..	430,090	1·13	Adelaide ..	196,567	1·17
Western Australia ..	306,129	.31	Perth ..	118,000	1·36
Tasmania ..	197,205	7·52	Hobart ..	39,107	4·88
Territories—					
Northern ..	3,475	.01	.. ..	.. ..	.. ..
Federal ..	1,940	2·16	.. ..	.. ..	.. ..
Australia ..	4,727,879	1·59	.. ..	.. ..	.. ..
New Zealand ..	1,052,545	10·05	Wellington ..	72,892	4·20

Melbourne compared with Sydney. Melbourne is spread over nearly double the area of Sydney (the capital city of New South Wales), the population of which is more concentrated than that of any other Australasian capital. The growth of the two cities is shown in the following statement :—

Year.	Enumerated Population.		Year.	Enumerated Population.	
	Melbourne and Suburbs.	Sydney and Suburbs.		Melbourne and Suburbs.	Sydney and Suburbs.
1836 ..	224	19,729	1881 ..	282,947	224,939
1841 ..	4,479	29,973	1891 ..	490,896	383,283
1846 ..	12,351	38,358	1901 ..	496,079	481,830
1851 ..	39,000	44,240	1911 ..	593,237	636,355
1861 ..	139,916	95,789	1912 (estimated) ..	628,430	694,800
1871 ..	206,780	137,776			

A comparison of Melbourne and Sydney with other large cities of the world is of interest. The table which follows contains a list of some of the principal of those having a population in excess of 500,000. Of the cities in the British Empire, Sydney occupies the seventh and Melbourne the eighth place.

POPULATION OF PRINCIPAL CITIES OF THE WORLD.

City.	Country.	Year of Enumeration or Estimate.	Population.
Greater London .. .	England .. .	1911	7,252,963
New York .. .	United States .. .	1912	5,173,064
Paris .. .	France .. .	1911	2,888,110
Tokio .. .	Japan .. .	1909	2,186,079
Chicago .. .	United States .. .	1910	2,185,283
Vienna .. .	Austria .. .	1910	2,107,981
Berlin .. .	Prussia .. .	1910	2,070,695
St. Petersburg .. .	Russia .. .	1910	1,907,708
Philadelphia .. .	United States .. .	1910	1,549,008
Moscow .. .	Russia .. .	1910	1,493,600
Buenos Aires .. .	Argentine Republic .. .	1912	1,383,663
Osaka .. .	Japan .. .	1909	1,226,647
Calcutta .. .	India .. .	1911	1,216,514
Constantinople .. .	Turkey .. .	1909	1,200,000
Canton .. .	China .. .	1909	1,000,000
Bombay .. .	India .. .	1911	979,445
Manchester (with Salford) .. .	England .. .	1912	956,265
Hamburg .. .	Germany .. .	1910	932,078
Buda-Pest .. .	Hungary .. .	1910	880,371
Rio de Janeiro .. .	Brazil .. .	1910	870,475
Warsaw .. .	Russia .. .	1910	855,900
Birmingham .. .	England .. .	1912	850,947
Tient-sin .. .	China .. .	1909	800,000
Glasgow .. .	Scotland .. .	1912	785,600
Liverpool .. .	England .. .	1912	752,021
Brussels .. .	Belgium .. .	1910	720,347
Pekin .. .	China .. .	1908	700,000
Sydney .. .	New South Wales .. .	1912	694,800
Naples .. .	Italy .. .	1912	692,171
Cairo .. .	Egypt .. .	1910	683,353
Bangkok .. .	Siam .. .	1909	628,675
Melbourne .. .	Victoria .. .	1912	628,430
Munich .. .	Bavaria .. .	1910	608,375
Milan .. .	Italy .. .	1911	602,236
Madrid .. .	Spain .. .	1910	599,807
Barcelona .. .	Spain .. .	1910	587,284
Amsterdam .. .	Holland .. .	1911	580,960
Madras .. .	India .. .	1910	568,146
Copenhagen .. .	Denmark .. .	1911	559,398
Dresden .. .	Saxony .. .	1910	551,697
Rome .. .	Italy .. .	1911	538,634
Breslau .. .	Prussia .. .	1910	514,765

It is not proposed in this article to scrutinize the statistics relating to births, marriages, and deaths occurring in the State; but, as these occurrences have an important bearing on the future increase or decrease in the population, a reference to them is necessary. The subjoined table contains a statement of the birth, marriage, and death rates in Victoria for the last ten years.

**Birth, Marriage,
and Death
Rates.**

also of the rates in the Commonwealth of Australia and in England and Wales for the same period :—

BIRTH, MARRIAGE, AND DEATH RATES.

Year.	Births per 1,000 of Population.			Marriages per 1,000 of Population.			Deaths per 1,000 of Population.		
	Victoria.		England and Wales.	Victoria.		England and Wales.	Victoria.		England and Wales.
	Australia.			Australia.			Australia.		
1903 ..	24·3	25·3	28·5	6·2	6·7	7·8	12·8	12·1	15·5
1904 ..	24·4	26·4	28·0	6·7	7·0	7·6	11·8	11·1	16·3
1905 ..	24·6	26·2	27·3	7·2	7·2	7·6	12·0	10·9	15·3
1906 ..	24·9	26·6	27·2	7·2	7·5	7·8	12·3	10·9	15·5
1907 ..	25·0	26·8	26·5	7·6	7·8	7·9	11·6	11·0	15·1
1908 ..	24·6	26·2	26·7	7·4	7·6	7·5	12·4	10·9	14·8
1909 ..	24·6	26·6	25·8	7·4	7·9	7·3	11·3	10·3	14·6
1910 ..	24·2	26·7	25·1	7·8	8·4	7·5	11·3	10·4	13·5
1911 ..	25·0	27·2	24·4	8·4	8·8	7·6	11·5	10·7	14·6
1912 ..	26·4	28·6	23·8	8·7	9·1	7·7	12·2	11·2	13·3

The above are crude rates, and, without the application of correcting factors, do not give a proper indication of the relative frequencies or fertilities of marriages in the places mentioned, or of the extent to which the inhabitants of each community are affected by the health conditions under which they exist. They give a good indication, however, of the extent to which the population is likely to be increased by births, or depleted by deaths, in the near future.

In the following table the rate of natural increase of the Victorian population (excess of births over deaths) is compared with that existing in other parts of Australasia and a number of countries in other parts of the world :—

NATURAL INCREASE PER 1,000 OF THE POPULATION IN VICTORIA AND ELSEWHERE.

Country.	Natural Increase per 1,000 of Population.	Country.	Natural Increase per 1,000 of Population.
Tasmania ..	19·2	Norway ..	12·5
Western Australia ..	18·0	Hungary ..	12·0
New South Wales ..	17·9	England and Wales ..	11·7
Russia (European) ..	17·7	Scotland ..	11·5
Queensland ..	17·5	Italy ..	11·4
New Zealand ..	17·3	Sweden ..	11·2
Australia ..	16·4	Japan ..	11·0
South Australia ..	16·4	Switzerland ..	9·8
The Netherlands ..	15·3	Spain ..	9·3
Denmark ..	14·5	Belgium ..	8·9
Germany ..	14·1	Ireland ..	6·1
Victoria ..	13·2	France ..	·7

The favorable position occupied by Victoria, in comparison with the majority of countries beyond Australasia, as regards the natural increase of its population, is wholly due to its low death rate. In most of the European countries there is a higher birth rate, but this advantage is more than counterbalanced by a higher rate of mortality.

In Victoria, as in most other civilized countries, the birth rate has shown a tendency to decrease for a number of years. It is commonly observed that with an advance in the standard of living in a community there is a decline in its birth rate. On the other hand, marriages are more frequent during a period of prosperity than during the existence of a depression, and an increase in marriages leads to a larger number of births. The seasons for a number of years past have, with one or two exceptions, been favorable, and the marriage rate has shown an increase in each of the last three years. There has been an advance in the birth rate in each of the last two years, and this is doubtless accounted for partly by the higher marriage rate.

After making allowances for variations in the age distribution of married women in different census years, it has been found that the legitimate births in 1911 per 1,000 wives, aged 15 to 45, were fewer by 71 than in 1881, by 50 than in 1891, and by 7 than in 1901. The figures for each of the last five census years are as follows :—

Year.	Legitimate Births per 1,000 Married Women, 15-45.		Year.	Legitimate Births per 1,000 Married Women, 15-45.	
	1871	1881	1891	1901	1911
..	302·7	303·1	282·0	238·7	231·5

The figures for the other Australian States and New Zealand show a somewhat similar decline, and in nearly all European countries the ratio of births to wives of reproductive age are less, and in some instances considerably less, than formerly.

The death rates of each sex at various ages in Victoria and Australia **Death Rates at Various Ages.** for the period 1909-11, and in England and Wales for the period 1906-10, are shown in the following table :—

DEATH RATES AT VARIOUS AGES IN VICTORIA, AUSTRALIA, AND ENGLAND.

Annual Deaths per 1,000 of each Sex.

Age Group.	Males.			Females.		
	Victoria. 1909-11.	Australia. 1909-11.	England and Wales. 1906-10.	Victoria. 1909-11.	Australia. 1909-11.	England and Wales. 1906-10.
0-5	24·0	23·4	43·5	18·9	19·4	36·0
5-10	2·0	2·1	3·2	1·9	1·9	3·3
10-15	1·7	1·7	1·9	1·5	1·5	2·0
15-20	2·5	2·6	2·8	2·4	2·3	2·6
20-25	3·1	3·4	3·7	3·5	3·4	3·1
25-35	4·3	4·3	5·3	4·6	4·5	4·5
35-45	7·1	7·3	9·2	6·4	6·2	7·6
45-55	12·5	12·8	16·6	8·9	8·8	12·9
55-65	25·3	25·2	33·0	17·6	17·0	25·3
65-75	62·1	56·2	70·9	45·7	43·6	58·7
75-85	138·2	127·8	138·1	109·1	105·8	125·6
85 and upwards	269·6	273·8	312·4	239·7	229·0	291·6
All Ages	12·8	11·6	15·6	10·2	9·2	13·8

The low mortality rate at almost every age period in Victoria, by comparison with that in England and Wales, evidences the healthy climate and the favorable social and industrial conditions of the State. A striking feature of the Victorian and Commonwealth mortalities is the light rate among children. For each age period after 35, except 75-85 for males, the death rates for both sexes in Victoria are lighter, and at some ages considerably lighter, than in England.

A comparison of Victorian and English mortalities in respect of some of the more important diseases is of interest. This is given below for the latest five-year periods for which the information is available :—

Cause of Death.	Deaths per Million of Population.	
	Victoria, 1908-12.	England and Wales, 1907-11.
Typhoid Fever .. .	98	65
Scarlet Fever .. .	16	76
Measles .. .	33	309
Whooping Cough .. .	77	248
Diphtheria and Croup .. .	122	151
Influenza .. .	109	222
Cancer .. .	833	954
Pulmonary Tuberculosis .. .	855	1,088
Other Tubercular Diseases .. .	182	442
Diabetes .. .	107	104
Pneumonia and Broncho-pneumonia .. .	834	1,199
Bronchitis—Acute and Chronic .. .	348	1,086
Diarrhoeal Diseases .. .	833	1,272*

* Year 1911.

It will be seen from these figures that the mortality in Victoria from nearly all of the diseases mentioned is proportionately much less than in England. The climatic, social and hygienic conditions prevailing in the State are very favorable to infant life. This is evidenced by the fact that of every 100 infants born the number dying within a year is 7·6 in Victoria as compared with 11·7 in England.

The expectation of life at birth or age "0" in Victoria is, in the subjoined **Expectation of Life.** statement, compared with the corresponding expectation in England and Wales :—

EXPECTATION OF LIFE AT BIRTH.

Year.	Males.		Females.	
	Victoria.	England and Wales.	Victoria.	England and Wales.
1896 .. .	51·11	44·31	54·12	47·77
1906 .. .	55·06	*	58·46	*

* Not available.

At the last census date a number of particulars were obtained in regard to the housing of the people. A majority of the people—about 63 per cent.—occupy wooden houses, and about 30 per cent. reside in brick structures. The weekly rental values of private dwellings in 1911, according to information supplied by the occupiers of the premises, were as under:—

WEEKLY RENTAL VALUES OF PRIVATE DWELLINGS IN VICTORIA AT THE
CENSUS OF 1911.

Weekly Rental Value.	Number.	Weekly Rental Value.	Number.
Under 1s.	641	30s. and under 31s.	2,186
1s. and under 2s.	4,324	31s.	40
2s. " 3s.	8,191	32s.	271
3s. " 4s.	7,106	33s.	42
4s. " 5s.	9,300	34s.	66
5s. " 6s.	24,887	35s.	566
6s. " 7s.	16,927	36s.	31
7s. " 8s.	19,136	37s.	68
8s. " 9s.	17,984	38s.	56
9s. " 10s.	9,331	39s.	6
10s. " 11s.	30,166	40s.	
11s. " 12s.	7,508	£2	1,044
12s. " 13s.	15,333	£2 5s.	160
13s. " 14s.	4,601	£2 10s.	323
14s. " 15s.	4,391	£2 15s.	40
15s. " 16s.	11,264	£3	277
16s. " 17s.	3,641	£3 5s.	23
17s. " 18s.	3,551	£3 10s.	49
18s. " 19s.	2,079	£3 15s.	17
19s. " 20s.	251	£4	107
20s. " 21s.	7,929	£4 5s.	4
21s. " 22s.	1,004	£4 10s.	12
22s. " 23s.	1,619	£4 15s.	1
23s. " 24s.	495	£5	110
24s. " 25s.	146	£6	35
25s. " 26s.	3,945	£7	17
26s. " 27s.	187	£8	16
27s. " 28s.	693	£9	1
28s. " 29s.	117	£10 and upwards	17
29s. " 30s.	38	Unspecified	41,264
		Total	263,634

Density of Population.

The density of the population in each of the last six census years is shown in the following statement:—

DENSITY OF POPULATION.—RETURN FOR SIX CENSUS YEARS.

Year of Census.	Persons to the Square Mile (exclusive of Persons in Ships).	Inhabited Dwellings to the Square Mile.	Persons to the Inhabited Dwelling (exclusive of Persons in Ships).	Rooms to a Dwelling (Inhabited and Uninhabited).	Persons to a Room.
1861	6·126	1·470	4·16	2·96	1·35
1871	8·298	1·714	4·84	3·89	1·18
1881	9·791	1·935	5·06	4·44	1·08
1891	12·948	2·549	5·08	5·10	.92
1901	13·643	2·747	4·97	5·25	.90
1911	14·915	3·112	4·79	5·51	.87



TYPES OF VICTORIAN NATIVES.—BOYS WATCHING FOOTBALL MATCH.

The time which has elapsed since the first effective colonization of Victoria—a little over 60 years—is not sufficient to allow of the development of special race characteristics. The great majority of the people are of British extraction, and at present the Victorian native whose parents or grandparents were born in Britain is not markedly different from the British immigrant. The climate of Victoria is very different from that of Britain, and the comparatively favorable conditions under which the natural resources are being developed, and the manufacturing industries carried on, make the struggle for existence less keen than in European countries. The distinctive Australian conditions are bound to have their effect on the race in course of time, but generations may elapse before a well-defined Victorian type is evolved.

Victoria is a country possessing great natural resources, and will ultimately be capable of sustaining a much larger population than it contains at present. With an increase in the area of cultivated land, an extension of closer settlement, and a more extensive adoption of scientific methods in extracting from the soil its various products, there will be a substantial increase in production and a largely increased demand for labour of all kinds.

General Remarks. The railway system is being gradually extended to the more remote districts, and this will very materially assist in the settlement of those areas. In Melbourne there is unfortunately some overcrowding; but a large proportion of the working classes live in detached and semi-detached houses, which are much superior to the tenement houses occupied by the corresponding classes in Britain. A glance at the map of the city shows that it covers a much greater area than a town with the same population in Britain. Houses extend in most directions from 5 to 7 miles from the centre, and in some directions to a much greater distance, the limit being about 11 miles. The official area of Greater Melbourne is the district embraced within a radius of 10 miles from the General Post Office, and, although there is at present a good deal of open country within this area, it would be difficult to fix on one which would be more suitable.

There are no other towns in the State which approach the metropolis in population. It is probable that the disparity which at present exists will gradually be lessened, as the Government is taking steps to bring about decentralization of traffic, and this should have the effect of increasing the importance of some of the smaller towns.

Victorians live at a distance of 11,300 miles from the centre of the Empire, but, with improvements in the means of communication, the distance is gradually becoming of less consequence. It does not prevent them from being kept in close touch with what is happening in the centres of civilization, and it has some advantages, in that it enables them to work out their destiny under healthier conditions, and with fewer restrictions, than is possible in the case of the majority of persons living in the densely populated countries of the old world.

IMMIGRATION INTO VICTORIA.

By S. Whitehead, Officer in Charge of Victorian Immigration Bureau.

Actuated by a patriotic and statesmanlike desire for the progress of the State by developing to their full and abundant capacity the resources and opportunities it possesses, but also recognizing the supreme necessity for effectively peopling the country as a safeguard against aggression and a guarantee of peaceful occupation, the Government of Victoria is steadily pursuing a policy for the liberal encouragement of immigration. Desirable persons of white race and especially people from Great Britain, Europe, and North America are freely invited, and frequently financially assisted, to come and establish homes in the State, to share in the prosperity which is here enjoyed, and to avail themselves of the opportunities for comfort and advancement which freely attend upon the labours of the industrious and the thrifty, under the liberal laws and the free conditions by which the community is regulated and governed.

With an area of 2,974,581 square miles, the population of the Commonwealth of Australia, according to the most recent statement

**Commonwealth
of Australia—
Area and
Population.** issued by the Commonwealth Statistician, is 4,836,602 persons. The density of the population is about 1·6 to the square mile, and Australia, with its enormous possibilities, is, therefore, the most sparsely peopled of the civilized countries of the world.

The State of Victoria has an area of 87,884 square miles, the smallest in the Commonwealth with the exception of Tasmania, and **Victoria—Area
and Population.** a population of 1,399,328. With an average of fifteen persons to the square mile, Victoria is more favorably placed in regard to density of population than any of the sister States.

In some other respects, however, Victoria is at present shown in an unfavorable position by the population and vital statistics of the Federation. She is the only State in which males are outnumbered by females, the respective totals being—

Males	698,729
Females	700,599

and she also possesses the lowest birth rate and the highest death rate amongst all the States of the Commonwealth, so that her possible rate of gain in

Vital Statistics. population by natural increase is less than in the case of any of the others. These results are all attributable to one main cause. They are due to the well recognized fact that Victoria, through the enterprising character of her people, has contributed largely of her manhood to the work of pioneering and development in other States; the circumstances are only mentioned here because of the bearing they have on the immigration question, increasing as they do the necessity for action to make good from other sources the losses caused by their detrimental effect.

Migration results for 60 years. Before proceeding to describe in some detail the methods and aims of the present Victorian immigration policy, it may be interesting to glance briefly at the results which have followed the migration of population during the 60 years or so of the State's history as a self-governing community. For the ten years from 1851 to 1861, following upon the discovery of gold, the excess of immigration over emigration amounted to 400,045 persons, but it is a remarkable fact that over the period of fifty (50) years which then ensued the State made no gain but rather a loss by migration. The net result as far as this period is concerned is shown by the following table:—

VICTORIAN MIGRATION.

	Period.		Gain.	Loss
1861-1871	41,789	..
1871-1881	15,332
1881-1891	116,950	..
1891-1901	111,848
1901-1911	42,340
Totals	158,739	169,520
Net Loss	10,781

The State during those fifty (50) years had not even benefited to the extent of her natural increase, which amounted to 786,000, for, while the population in 1861 stood at 462,977, it had only reached in 1911 a total of 1,238,477.

Space does not permit of a discussion of the causes which have led to this result. It is sufficient to say that they do not reflect adversely upon the resources, the productive capacity, or the general possibilities of the State. As already indicated, Victoria has contributed largely to the colonization and development of other parts of the Continent, and it is chiefly to other States that the population has moved.

ASSISTED IMMIGRATION.

The assistance of immigrants to Victoria is no new movement. It was practised from the earliest beginnings of the State up to the year 1873, when the policy was discontinued. During this period the **Early records.** number of persons assisted was 168,357. It was in 1909 that assisted immigration was again taken up by the Government, and the number of people who have since been directly helped to reach the State has been 36,064.

Net gain for five years.

The advertising of the country and its resources, which has accompanied the immigration policy, has, however, attracted a large number of others, who have made their own way to Victoria, with the consequence that the net gain in population by immigration from oversea countries for the five years since 1909 has been 48,411.

Metropolitan Aggregation. Victoria shares with other countries of the world in a marked degree the tendency on the part of the people to aggregation in the cities. Nearly half the population of the whole State is centred in Melbourne and its suburbs.

The chief aim of the Government, therefore, in giving effect to its immigration policy, is to attract to the country people who will undertake settlement on the land or obtain employment and residence in rural districts, and such people are granted substantial assistance by way of concessions on passage money as well as in other directions.

Objects of Immigration Policy. The rates of passage money paid by the Government for third class accommodation from Great Britain and Europe, under contracts which have been made with shipping companies, are £14 per adult, with half rates for children between three (3) and twelve (12) years of age, and on these rates substantial reductions are made to various classes of approved immigrants.

Operations in connexion with assisted immigration are conducted under two distinct systems of

- (1) Nomination and
- (2) Selection.

1. Under the *Nomination System*, persons already resident in the State may nominate relatives or friends for assisted passages to Victoria from Great Britain, Europe, or America. Nominations are required to be accompanied by a deposit of portion of the passage money with satisfactory guarantees for payment of the balance, which is payable by instalments after the nominee has arrived in the State, and for the

The Nomination System. fulfilment of other conditions as to residence, &c., as expressed in the nomination agreement. Upon acceptance

of a nomination, booking and other arrangements for the persons nominated are effected by the Government's representatives in England or elsewhere. After arrival in Victoria, when a portion of the balance referred to, making up the *net passage money*, has been paid, and the nominee has given satisfactory evidence of intention to take up permanent residence in the State, the transaction is closed by a virtual allowance to the parties concerned of a considerable rebate on the gross passage rates.

The net rates chargeable for passages under the nomination system vary with the relationship of the nominee to the nominator. They have been expressly made lower for wives and children than for other persons in order to facilitate re-union of families. Generally speaking it will be seen that the net rate for wives from Great Britain is £4 each; for husbands, £8; for daughters, £4; for sons, £8; and for other relatives or friends, £10; with half-rates for children between three and twelve years.

The rates and conditions of payment can be clearly seen from the following table :—

EMIGRATION FROM EUROPE AND NORTH AMERICA TO VICTORIA (AUSTRALIA).

Nominated Assisted Passages.

Any resident of Victoria may nominate persons of white race for assisted passages from Europe to Victoria (Australia) at the following cheap rates of passage money :—

TABLE SHOWING CONDITIONS OF PAYMENT FOR NOMINATED PASSAGES.

When the nominees are the wife, husband, or family of the nominator the payments are :—

	Net Passage Money.			Govern- ment Contri- buti- on.	Total Fare.
	Deposit.	Balance payable by six equal monthly instalments.			
Wife	2 0 0	2 0 0		10 0 0	14 0 0
Daughters over 12 years*	2 0 0	2 0 0		10 0 0	14 0 0
Husband	4 0 0	4 0 0		6 0 0	14 0 0
Sons over 12 years*	4 0 0	4 0 0		6 0 0	14 0 0
Children, 3 to 12 years	1 0 0	1 0 0		5 0 0	7 0 0
One child, under 3 years	Free	Free		Free	Free
Each additional child, under 3 years	0 10 0	0 10 0		2 10 0	3 10 0

* These special rates do not apply to sons or daughters who may be married or who (if travelling without their parents) exceed 18 years of age. The rates payable under the next table then apply.

When the nominees are friends or relatives of the nominator the payments are :—

	Net Passage Money.			Govern- ment Contri- buti- on.	Total Fare.
	Deposit.	Balance payable by six equal monthly instalments.			
Adults (either sex)	£ 6 0 0	£ 4 0 0		£ 4 0 0	£ 14 0 0
Children, 3 to 12 years	3 0 0	2 0 0		2 0 0	7 0 0
One child, under 3 years	Free	Free		Free	Free
Each additional child, under 3 years	1 10 0	1 0 0		1 0 0	3 10 0

2. Under the *System of Selection*, assisted passages from Great Britain,

Assistance for Selected Immigrants. Europe, or North America to Victoria are granted to persons selected and approved by official representatives of the State who are located in England and in North America.

The classes of persons for whom these assisted passages are authorized are :—

- (a) Farmers or land-seekers, with capital, and (if married) their wives and families.

- (b) Farm workers, and (if married) their wives and families.
- (c) Lads prepared to accept farming employment, with or without previous experience of such work.
- (d) Domestic servants.

The rates of passage money payable by these various classes of immigrants are as follows :—

TABLE SHOWING RATES OF PASSAGE MONEY FOR ASSISTED IMMIGRANTS.

Class of Immigrant.	Rate per Adult.
Land settlers and their wives and families	£8 (a refund of £2 to be allowed if the settler is possessed of capital to the amount of at least £150, provided such capital is transferred to Victoria through the Agent-General's office or the State Savings Bank, or subject to other satisfactory evidence of such possession and transmission, and provided also that the settler undertakes farming operations on his own account in Victoria within twelve months of his arrival)
Farm labourers (experienced) and their wives and families	£8
Farm labourers (inexperienced) and their wives and families	£10
British lads	£7
Domestics	£3

Children between three and twelve years of age, travelling with their parents, half fare; one child under three years of age, no berth provided, free of charge; if more than one child under three years of age, a quarter each, exclusive of the one taken free.

Note.—All rates are fixed on the basis of a minimum gross charge per berth of £14. For any berth in excess of this value the additional charge is to be borne by the passenger.

(a) *Farmers or Land-seekers with Capital.*

The policy of the Victorian Government in regard to land settlement is largely directed to increasing the number of land-holders and the areas under cultivation, by the subdivision into smaller holdings and subsequent occupation of large estates and areas which have been repurchased by the State under provisions of the Closer Settlement Acts. These estates, which comprise some of the best agricultural and orchard land in the State, are situated in well-settled districts, with good railway and road facilities, and in close proximity to towns, markets, churches, schools, post offices, banks, stores, and other facilities. They are made available in—

Farm allotments,
Agricultural labourers' allotments, and
Workmen's homes' sites,

and are sold by the Government to farmers and land and home seekers under easy terms, which provide for payment of a deposit of three (3) per cent. of the value of the land, with 25s. for lease and registration fees, and three (3) per cent. half-yearly thereafter for a period of 31½ years. This rate of

six (6) per cent. includes four and a half ($4\frac{1}{2}$) per cent. interest on purchase money and one and a half ($1\frac{1}{2}$) per cent. as a yearly payment on account of the purchase money itself. At the end of the period of $31\frac{1}{2}$ years, all payments having been met, the land becomes the property of the purchaser, and a Crown Grant is issued. The terms of purchase contain, of course, other conditions as to improvements, residence, &c., but as regards these it is unnecessary to go into detail here.

In subdividing and selling these estates the Government does not seek to make a profit on its transactions, but merely adds to the cost of the land and to interest rates such extra charges as are necessary to meet administrative and other expenses: the object kept constantly in view is the closer settlement and increased productiveness of the country.

It is to acquire land and make homes under these conditions, in a rich, prosperous and fertile country, that farmers and land-seekers are invited to come to Victoria from overseas.

The attention of oversea settlers is chiefly directed by the Government to the irrigable districts of the State, which include areas available for

Settlement in Irrigation Areas. occupation where land is of excellent quality, and water is cheaply and easily applied under irrigation systems as effective, economical, and complete as are to be found in any other country.

The settlement of these irrigable areas is controlled by the State Rivers and Water Supply Commission (Mr. Elwood Mead, Chairman). The land is made available in allotments which average about fifty (50) acres, and the Commission requires as one of the conditions, that the prospective settler shall be possessed of capital sufficient to justify well-grounded expectations of success. Generally speaking, the minimum amount of capital required is £300, but no rigid rule is adopted. A great deal depends in this matter upon the settler and his qualifications and experience, and suitable applicants are frequently accepted with considerably less than the sum mentioned.

Upon these areas, previously occupied by only a few people, settlers have already been successfully established during the last four years to the number of 1,200, representing a total population of about 5,000, and there is land now available for thousands of others.

The climate, the soil, and the proper application of water combine to produce in the irrigation areas conditions which place the land in the first rank for fruit-growing, as well as for other productive purposes. Land of excellent suitability for citrus production is available. The majority of the settlers look confidently forward to fruit-growing as the occupation which will yield them in the early future comfort and independence. For the most part, until their orchards become established, and in order to obtain immediate returns, they engage in dairying work. Under intense culture and with irrigation their holdings produce good crops of lucerne and other fodders, so that dairying operations at an early stage of settlement can be made very profitable.

As settlement progresses and the areas become occupied, land in the irrigation districts will, before many years are past, become much enhanced in value, and in this, as well as other directions, the early settlers will reap great benefits.

There are, of course, numerous other directions in which the land-seeker or farmer with moderate capital may find favorable opportunities for settlement and advancement.

(b) *Farm Workers.*

A good demand for agricultural and farm workers in the wheat-growing areas and the dairying districts of Victoria exists practically throughout the whole year. It is, however, most active during the cultivation season, usually from March to July, and from the commencement of the dairying season in August till the completion of harvesting operations in December or January.

Farm workers from overseas are freely invited by the Government to partake of the advantages offering through the immigration system. For men with good experience, constant employment is available at wages from 20s. to 25s. per week, with board and lodging, and with rates in the harvest season (extending over about two months, in November and December) which are increased to 36s. and 48s. per week, with board, &c.

The thrifty and industrious farm worker, with his possibilities for money saving, can look forward after a few years of work to owning land and becoming a farmer on his own account. Opportunities of this kind have been availed of in Victoria in thousands of cases, and they will continue to be available in the future.

(c) *Lads for Farm Work.*

This phase of immigration under which lads from Great Britain have been assisted to come to Victoria to engage in farm employment, whether with or without experience in such work, has been greatly extended during the year 1913, with very successful and satisfactory results. An excellent demand has existed for their services, and the object has been to place the lads on farms where they may have opportunities of gaining good knowledge and experience of farming work and methods. The lowest wage accepted has been 10s. per week, with board and lodging, for inexperienced lads, higher rates being paid to those with useful experience. Upwards of 2,300 lads from Great Britain have been so placed during the year just ended. The reports show that, as a rule, the lads have taken well to their new conditions and given great satisfaction to their employers. They are encouraged in habits of thrift by inducements and facilities to place their earnings in the State Savings Bank, and there is every justification for the belief that they also, with industry and care, may look forward to becoming farmers and land-owners after the lapse of a few years.

(d) *Domestic Servants.*

The shortage of domestic servants in Victoria is so pronounced, and the difficulties which follow the impossibility under present conditions of securing adequate household assistance are so great, as to make the problem of obtaining an effective supply a matter of great importance. In country districts where, probably, the trouble is more acutely experienced than in the metropolis, the difficulties resulting from the scarcity of this form of help are so severe as to constitute a serious obstacle against the progress of settlement.

By offering passages from Great Britain to Victoria to approved girls at the very low rate of £3 each, the Government is taking practical steps to in some measure relieve the position. Over 1,500 girls have been brought to the State in this way during the last two years, but the supply available from this source falls far short of requirements.

Excellent opportunities of employment are available in Victoria for capable girls, literally in thousands, under conditions in which they are certain of good treatment, good homes, and good wages. The servant mostly required is the one who can undertake the general duties of a small household, and a competent girl of this kind will find her services eagerly in demand at wages of from 12s. to 20s. per week, with, of course, her board and lodging. Good cooks are easily placed at wages up to 20s. and 25s. per week. Willing girls for training in household duties are also in good demand at from 8s. to 10s. per week, while for competent helps of other classes, such as housemaids, laundresses, &c., there are always ample opportunities.

SUMMARIZED RESULTS FOR 1912 AND 1913.

The following statements show the numbers of the various classes of assisted immigrants introduced into Victoria under Government arrangements for the two years, 1912 and 1913 :—

Arrivals 1912 (Assisted).

As farmers or land-seekers, 383, making with wives and families a total of	1,557
As farm labourers, 1,373, including lads, making with wives and families a total of	2,305
Domestic servants	705
Persons nominated	6,223
Persons booked through the Immigration Department, but paying their own passages	324
In addition, during 1912, the immigration policy was extended to assist artisans and women factory workers, who arrived in the following numbers :—	
Artisans (1,139) and families	2,473
Women workers	429
making a total of assisted new arrivals for the year 1912 of ..	14,016

Arrivals 1913 (Assisted).

As farmers or land-seekers, 229, making with wives and families a total of	645
As farm labourers, 1,460, making with wives and families a total of	2,097
Domestic servants	803
Persons nominated	4,963
Persons booked through the Immigration Department, but paying their own passages	1,020
Lads	2,280
Artisans	19
making a total of assisted new arrivals for the year 1913 of ..	11,827

The subjoined table shows the total net gain in the population of Victoria from oversea countries, according to actual records, by excess of immigration over emigration, for each of the five years since 1909 inclusive :—

1909	2,211
1910	3,415
1911	9,944
1912	21,835
1913	15,577
<hr/>							
Total	52,982
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EDUCATION IN VICTORIA.

By M. P. Hansen, M.A., LL.B., Inspector of Registered Schools.

I.—Primary Education.

(a) Historical Review.

1835.—The first permanent settlement of Port Phillip District (afterwards known as the Colony of Victoria, and now as the State of Victoria) was made in 1835. A census taken in the following year showed the total population of the district at 177 (142 males and 35 females), and it also recorded that a boy was born in the district in November of that year.

1841.—The population of the district rapidly increased, and six years later it amounted to 11,738, exclusive of Chinese and aborigines. At this time the number of children of school age was 2,329, of whom 691 were receiving instruction in twenty public and private schools, which were then provided.

1851.—The Act for the separation of Port Phillip from New South Wales came into operation ten years later, on 1st July, 1851. The Colony of Victoria was then created; responsible government was introduced four years later; and in 1856 the first free Parliament of Victoria was opened. At this time education was under the control of two independent Boards—the Denominational Schools Board, which had commenced operations in January, 1849, and the Board of National Education, appointed in the latter half of 1851. At the close of 1855 the former Board maintained 300 schools, with attendance enrolment of 17,711 scholars, or about one in eighteen of the population. The national system then had in operation 58 schools, with a total register of 3,532 scholars. Altogether about one person in thirteen of the population was receiving regular general education, but it must be remembered that, on account of the discovery of gold some years earlier, there was an unusually large proportion of adults to children. Difficulties arose from the existence of the system of dual control. The means of instruction were very inadequate, and there were almost inevitably opposition and obstruction from the co-existence of two Boards supporting and controlling schools in the same localities, and employing inspectors traversing the same ground. Money was wasted in supplying a number of small and inefficient rival schools in the centers of population where one large school would have served the purpose more efficiently and with greater economy in teaching and in administration, and, as a result of this waste, funds were not available for supplying schools in thinly populated districts, where it was desirable that they should be encouraged. The advantage of being first in the field and the strength of sectarian interests gave preponderance to the denominational system.

1862.—An attempt to unify the system was made in the *Common Schools Act* passed in 1862, which abolished the curious double system of control, by dissolving the two Boards, and established a new controlling body styled, “The Board of Education” consisting of five laymen, of whom no two were to be of the same religious denomination. To prevent needless multiplication of schools the Act provided that no school was in future to be

established within two miles of an existing school receiving State aid, and in the case of those then established within two miles of each other aid was not to be continued unless an average attendance of at least 60 scholars in each were maintained if the schools were within a municipal district, or of 40 scholars if they were not within such a district. This clause was the main defect of this Act, since the denominational schools in the larger centers of population could easily maintain the attendance specified, and consequently the waste of effort and money due to overlapping continued. Each school was under the management of a local committee, of which the clergyman of the church with which it was connected was usually the leading spirit, and this committee had the power of appointment and dismissal of teachers—subject to the approval of the Board of Education. The minimum average attendance for country schools to which aid would be granted by the Board was fixed at 20, and under the regulations half the cost of erecting and furnishing the buildings was to be supplied by the inhabitants concerned. These conditions, while permitting the maintenance of an unnecessary number of schools in some localities, prevented their establishment in poor and thinly populated districts, and at the same time no provision was made for part-time schools or itinerant teachers.

A Commission appointed in 1866 to inquire into the working of the *Common Schools Act* reported that the system did not appear to have produced a sufficient extension of the benefits of instruction, and that the educational results were not proportional to the public expenditure. Up till 1872 a fee ranging from 6d. to 2s. 6d. weekly was charged for all children except those whose parents were in destitute circumstances.

1872.—As a result of the report of this Commission, an Act repealing the *Common Schools Act* and establishing the present system of State primary education in Victoria was passed in 1872. The Acts of 1872 and 1910 constitute the most important enactments in the history of State education in Victoria. By the former Act the Board of Education was replaced by a Department of Education, presided over by a Minister of Public Instruction responsible to Parliament; schools, to be called State schools, were to be conducted in buildings vested in the Minister; education was to be free, secular, and compulsory; no teacher was to give any other than secular instruction in State school buildings, but with the consent of the local Boards of Advice elected by the ratepayers in each district, the State school buildings might be used for any purpose on days and at hours other than those required for secular instruction. Under this Act teachers became civil servants, and their appointments were made practically permanent. The terms "free, secular, and compulsory" were the watchwords of the agitation which culminated in the passing of this Act, under which education has been made free to all willing to accept it; compulsory in the sense that if children do not attend State schools evidence must be produced that they are under efficient and regular instruction in some other manner; and secular in that no State school teacher is allowed to give other than secular instruction in a State school building. Facilities are, however, provided for persons other than State school teachers to give religious instruction, on one or two days in each week, to the children of parents who desire that they shall receive such instruction.

The system of administration then became and has since remained a centralized one with its head-quarters in Melbourne, the chief administrative officers at that time being the Secretary for Education and the Inspector-General. All payments are made by the State out of the consolidated revenue, and the administration is charged with the full responsibility of carrying out the provisions of the various Acts of Parliament dealing with educational matters and of the regulations framed thereunder.

By the Act of 1872 the subjects of free instruction were—

Reading, Arithmetic, Writing, Grammar, Geography, Drill, and, where practicable, Gymnastics and Singing, and in addition Needlework for girls. The subjects now are :—

English (including phonics and voice exercises, poetry, reading, writing, spelling, composition, and grammar),

Number, Arithmetic and Elementary Mathematics,

Nature Knowledge (including geography, nature study, elementary science, and hygiene),

History and Civics,

Manual Training (including drawing, occupations such as modelling, paper folding, raffia, woodwork, &c., and needlework for girls),

Singing and Physical Training.

All instruction in State elementary schools, higher elementary schools, and district high schools is now free for children up to the age of fourteen years.

After the passing of the Education Act of 1872 head teachers and assistants, in addition to fixed salaries, were paid as "results" an amount up to 50 per cent. of fixed salary, such amount being determined by the percentage obtained at the inspector's annual examination of the school. This system of "payment by results" remained in operation nearly 30 years, and was abolished in 1901. The system encouraged a policy of cram which was fatal to intelligent teaching. It forced the adoption by all schools of a somewhat narrow and rigid curriculum and crippled the value of inspection, while at the same time the passing of examinations rather than true education became the main objective of school work.

1881.—In 1881 a Royal Commission was appointed to inquire into the administration, organization, and general condition of the then existing system of public instruction in Victoria. The most important result of this inquiry was the establishment of a Committee of Classifiers consisting of the Inspector-General (now the Chief Inspector), the head teacher of a large school, elected by the teachers, and a third person not an officer of the Public Service nominated by the Government. The duty of this Committee was (and is) to classify the teachers on the basis of literary qualifications, professional ability, good conduct, and length of service. At the same time teachers were then given and still have the right of appeal from the decision of the Classifiers to a Public Service Board (now to the Public Service Commissioner). This system is still in operation, though changes have been tried. Every three years a classified roll of teachers is compiled and published by the Classifiers. Supplementary rolls are issued every six months to notify changes occurring from time to time. Each teacher knows his exact position on the classified roll, all vacancies are advertized and appointments notified in *The Education Gazette and Teachers' Aid*—an official publication issued

monthly and supplied free to schools, so that each teacher is at once in a position to judge whether any one has been unfairly placed over his head. In the case of new appointments to the service every applicant's name is recorded according to his qualifications in an Employment Register in the order prescribed by law. By an Act passed in 1905 the Classifiers were directed to prepare in the month of June of every year from the first sub-class of the six classes in which teachers are classified a list to be known as the "Promotion List" of those teachers deemed most worthy of promotion to the next higher classes. The number of names to be placed in the promotion list of each class is determined by the number of promotions expected from that class during each year.

1893.—In 1893 began a period of severe financial depression and retrenchment. The Teachers' Training College was closed and remained so until 1900. Salaries and staffs were reduced, schools were amalgamated, junior teachers were largely employed in place of assistants, scholarships tenable at secondary schools were abolished, building and maintenance grants were cut down ruthlessly, and, in consequence, while the cost of education was lessened, the whole system was seriously impaired. An example may be cited. In 1893 the vote for State school buildings in Victoria was £128,470; in 1895 it was £6,651. With the return of prosperity came the deepening consciousness that Victoria was not keeping abreast of the educational developments of other countries, and accordingly in 1899 a Royal Commission was appointed to inquire into the whole system, with particular reference to technical education. This Commission made exhaustive inquiries, and issued a number of comprehensive recommendations for reforms which were then urgently needed. The re-opening of the Training College, the training of specialist teachers in kindergarten and infant-room work, in various forms of manual training, in cookery, in drawing, and in other subjects, the establishment of classes for teachers in properly equipped centers, an increase in the number of assistant teachers, increases in the salaries of all teachers, the raising of the age of exemption from compulsory attendance at school, the restoration of the scholarship system, and the abolition of the system of "payment by results" were some of the necessary reforms then recommended. All of these reforms have since been effected.

The system of administration was recast also. The Act of 1901 was the first of several Acts passed to carry out improvements in the system recommended by this Commission. This Act provided that a Director of Education should be the permanent head of the Department instead of a Secretary, and the office of Inspector-General was abolished. Inspectors, teachers, and other officers were to exercise such powers and duties as might be assigned to them by the Director. Under this Act the present Director of Education, Mr. Frank Tate, M.A., was appointed. Since 1901 there has been a marked and continuous educational advance. Gradually expanding systems for the more liberal professional training of teachers have been established. The course of free instruction has been twice revised and the present curriculum will, it is believed, bear favorable comparison with that of any other country.

But it was not until the passing of the *Education Act* of 1910 that the foundations were laid for a complete national system of education from the infant school to the highest educational institutions in the State.

Up to this time the Education Department was concerned mainly with the elementary school system, though under the Act of 1901 power was given for the establishment of continuation schools and special schools. Until the last decade the State neither provided secondary schools nor exercised any control over those which had been founded privately. The 1910 Act, passed in pursuance of recommendations made by the Director in a report issued after visiting Great Britain, Europe, and America, went much further than the 1901 Act, and provided for the establishment by the State of higher elementary schools, district high schools, and technical schools of various types, with the object of creating a co-ordinated system of public education leading through elementary schools and evening continuation classes to trade and technical schools on the one hand, or through elementary schools and high schools to the University and higher technical schools on the other. To provide for the due co-ordination of all branches of public education there was created a Council of Public Education, representative of the various educational and industrial interests of the State. This body, consisting of twenty members, presided over by the Director of Education, reports annually to Parliament.

The Act of 1910 abolished Boards of Advice and substituted for them a School Committee of not more than seven persons for each school or group of schools. These Committees represent the parents of the children in attendance, and stimulate local interest in the school. They exercise general supervision over the buildings and grounds, execute minor repairs and additions, help in establishing and improving school gardens and libraries, and in acquiring for the school accessories such as pianos, pictures, &c.; they also provide for the necessary cleaning of the buildings, and induce parents to send their children regularly to school.

The present system has now been in operation for upwards of 40 years without alteration in its main features other than those necessitated by growth and expansion. During the last few years this expansion has been very rapid, and to provide for increasing cost, especially in connexion with intermediate, secondary, and technical education, all of which is derived from State taxation, is a problem of great moment and complexity. The question of giving religious instruction as part of the free course is at present agitating the minds of many, and an inconclusive referendum was taken regarding this some years ago. Side by side with this question the claim for a Government grant to non-State schools has been urged, especially by Roman Catholic citizens who support the majority of such schools. This claim has become more insistent since the establishment of State high schools which compete with existing secondary schools not wholly under State control.

(b) Present Condition of Primary Education in Victoria.

The historical retrospect just given may help in realizing the present position. The administration of education for the State of Victoria is in the hands of a Minister who is responsible to Parliament. The present Minister is Sir Alexander Peacock. The permanent head of the Education Department is the Director of Education, Mr. Frank Tate, who, as previously stated, was appointed to this position about twelve years ago. The Minister has sole control of the educational funds set apart by Parliament, and

school sites and property are vested in him. He is obliged to lay before Parliament a report annually, and to prepare estimates of the expenditure for the coming year. He submits all regulations for adoption by the Executive Council, establishes new schools, and apportions the building grant.

Subject to the Minister, the Director of Education has general control of the administration of the Department. He submits all questions of policy to the Minister, he deals with questions affecting the appointment, promotion, transfer, and removal of teachers, approves of all important works before submission to the Minister, assigns duties to the inspectors and the clerical officers of the Department, and so on. He deals with all questions affecting the development and co-ordination of education within the Department or between the Department, the University, the registered (*i.e.*, non-State) schools, and the technical schools. He is a member of the Council of the University, and President of the Council of Public Education.

Under the Director the chief professional officers are Chief Inspectors (2), Assistant Chief Inspectors (3), Inspectors (31), the Principal and Lecturers of the Teachers' Training College, the Medical Officers (3), and the teachers in district high schools, higher elementary schools, elementary schools, and special schools. In administration, the work of the Department is divided into various branches, dealing with (*a*) elementary schools, special schools, and institutions for the training of teachers, (*b*) secondary and registered schools, (*c*) technical schools.

On 30th June, 1913, the number of localities provided with schools was 2,227. Of the schools, 2,031 were full-time and 95 were part-time schools, where a teacher is placed in charge of two schools and teaches on alternate days in each. There were also two itinerant schools. Of the day schools in operation, 732 (or more than one-third of the total number) are

State Elementary Schools. maintained for an average attendance of twenty pupils or less, so that the annual expenditure in these schools amounts to as much as £11 per child for expenses of instruction alone, the general average being £4 14s. In this connexion the scale of salaries paid to teachers in Victoria may be of interest. The facts that teachers are classified every three years in six classes and that an annual promotion list is published by a Board of Classifiers have already been mentioned. On passing through a course of training, young teachers are appointed to the lowest class, and the best of them rise quickly in the service.

Scale showing Classes, Subdivisions, and Rates of Annual Salary of State School Teachers :—

MALE TEACHERS.

Class.	Subdivisions.								
	1	2	3	4	5	6	7	8	9
Class VI.	£	£	£	£	£	£	£	£	£
V.	120	130	140	150	160	170	180	190	200
IV.	210	220	230	..	..	..	..	..	..
III.—Assistants	240	250	260	270	..	..	..	..	..
III.—Head Teachers	280	290	300	..	..	..	..	..	..
II.	280	290	300	310	320	..	..	..	..
I. { 1B.	340	350	365	380	395	..	..	..	..
1A	405	420	435	455	..	..	..	..	..
1A	460	470	480	500	..	..	..	..	..

Scale showing Classes, Subdivisions, &c.—*continued.*

FEMALE TEACHERS.

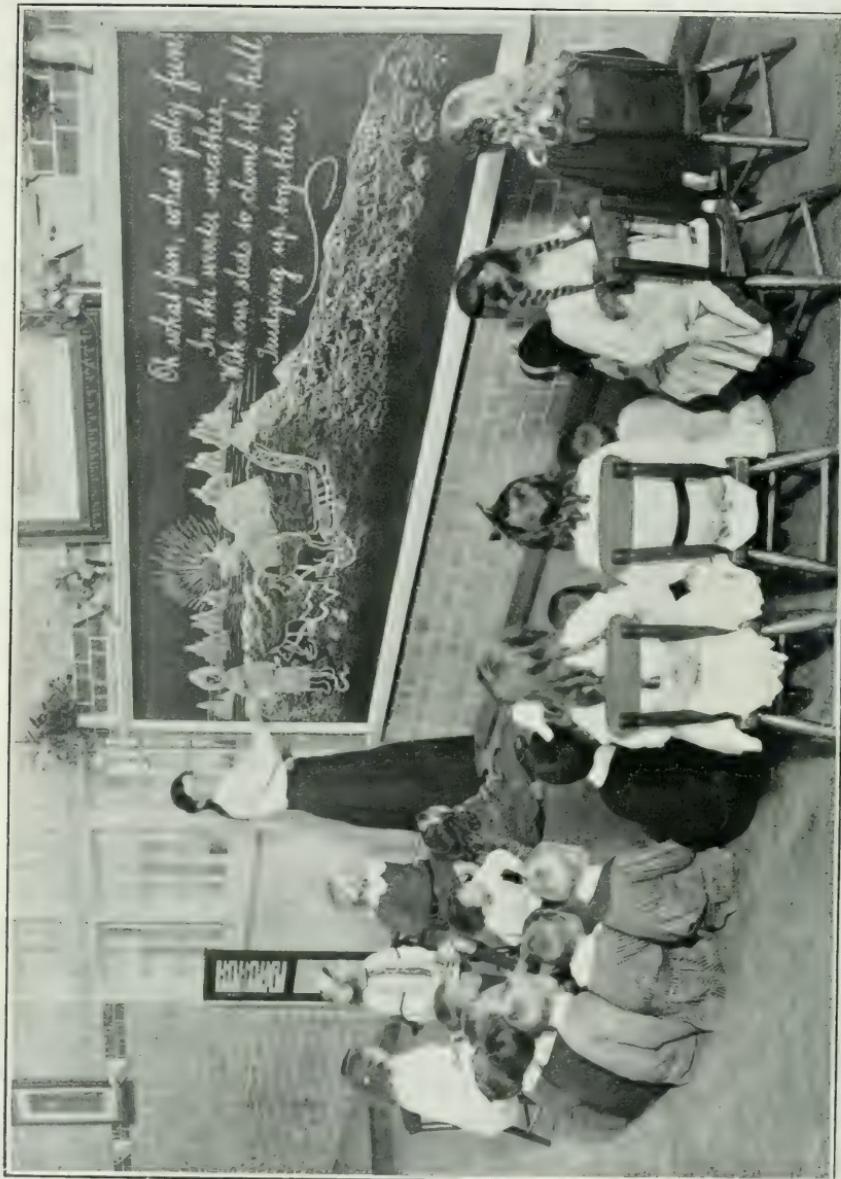
Class.	Subdivisions.								
	1 £	2	3	4	5	6	7	8	9
Class VI.—Assistants	80	90	100	110	..	..	..	..	..
VI.—Head Teachers	110	120	130	..	..	..	..	..	..
V.—Assistants	120	130	140	..	..	..	..	..	..
V.—Head Teachers	140	150	160	..	..	..	..	..	..
IV. ..	150	160	170	..	..	..	..	..	..
III. ..	180	190	200	210	..	..	..	..	..
II. ..	220	230	240	250	..	..	..	..	..

The number of teachers in each class is as follows:—

	Classification.	Number.		
		Males.	Females.	Total.
Head Teachers	First class ..	50	..	50
	Second class ..	47	..	47
	Third class ..	96	..	96
	Fourth class ..	201	2	203
	Fifth class ..	514	28	542
	Sixth class ..	525	619	1,144
Total Head Teachers ..		1,433	649	2,082
Assistants	Second class ..	3	50	53
	Third class ..	34	49	83
	Fourth class ..	57	95	152
	Fifth class ..	105	292	397
	Sixth class ..	101	624	725
Total Assistants ..		300	1,110	1,410

The total enrolment at State elementary schools during the year ended 30th June, 1913, was 241,042—124,663 being boys and 116,379 girls. The average attendance was 72·25 per cent. of the net enrolment. As the rules for marking the rolls are very stringent this result is regarded as very satisfactory. No child may be marked as present at a school meeting (morning or afternoon) unless in attendance at the calling of the roll, which must take place two hours before the time fixed for closing the school. Should the child leave before attending two hours the attendance is cancelled. No allowance is made for absence due to sickness or epidemics, or for low attendance caused by inclement weather, floods, &c. The result shows that during the year taken, each child enrolled attended 72 days out of each 100 school days.

Attendance at school is compulsory for all pupils between the ages of six and fourteen years. The course of free instruction is so graded that it should be accomplished by pupils between the ages of four and a half and fourteen years.



A PICTURE LESSON.

Pupils are classified in eight grades one for each year of school life between the ages of six and fourteen years. Recent returns show that 34·7 per cent. of the children are in the four higher grades, but in this connexion it should be remembered that pupils may transfer from the elementary school to the high school at the age of twelve years.

The total expenditure on education by the State for the year ended 30th June, 1913, amounted to £1,251,251. This amount was distributed thus :—Primary education, £761,692; intermediate and secondary education, £55,747; special subjects (including medical inspection), £20,536; training of teachers, £21,372; technical education, £49,139; University education, £38,460; administration (including inspection), £45,915; buildings, £158,028; and miscellaneous items (including pensions), £100,362. Omitting the cost of administration (including inspection), of buildings and of the Training College, the cost of instruction in elementary schools was £4 14s. per pupil. If the items omitted above are included, the cost per pupil amounts to £6 6s. 8 $\frac{3}{4}$ d. per pupil. The total cost of public education in Victoria is now 17s. 7d. per head of population.

Elementary schools may be divided broadly into rural schools, town schools with infant schools attached, special schools, and free kindergartens.

It has been maintained that in no other country does there exist such a fine system of small rural schools as obtains in each of the Australian States. As one would expect in the most densely populated State, the problem of securing the minimum attendance required for the opening of a school is not so pressing in Victoria as in the other States. Under the system of classification, which has been in operation for nearly a quarter of a century, teachers on the completion of their course of training when they are placed on the classified roll, must win their promotion by good work in the smaller schools. Young and enthusiastic teachers just entering on the work of their profession after their courses of training constitute

Rural Schools. a large proportion of our country school teachers. Many of the country schools are provided with residences for married teachers. On taking up duty at the school to which he is appointed, the teacher reports the fact to the correspondent of the School Committee and to his District Inspector, and teaches the subjects prescribed in the course of free instruction. Special efforts are made to secure local interest in the school; the School Committee represents the parents, and cordially assists the teacher in spreading the influence of the school. The type of building used for rural schools varies somewhat. During the last decade that shown in the illustrations on pages 112 and 113 has been used largely. This represents a country school in Gippsland. The gardens are kept by the children under the guidance of the teacher.

The plan shows an area of five acres around the school. An endeavour is being made to secure this minimum area as a site for every country school.

In addition to the gardens, there are in many school grounds experimental plots where the children are taught the elements of Agriculture. Nature Study is made a special feature of the work, and the work in Agriculture and

Horticulture is closely related to this. Special days are celebrated in each year. We have an Arbor Day to excite the desire to plant trees and care for them, a Bird Day to add to the children's knowledge of the value of birds, Discovery Day to promote the study of Australian history, and Empire Day to give knowledge of, and pride in, the Empire. On these occasions the parents are invited to attend the school and to take part in the functions. In many schools there is what is termed a parents' visiting day when parents come to the school and see the children at work. As might be expected in a nation that is taking such strong measures in organizing a system of defence, physical training receives special attention in all the schools. This work is taken daily, and the introduction of organized games into the course during recent years has led to a revival of the play spirit which had seemed to be languishing in the younger generation. The Victorian country boy will be found to be sturdy, independent, and courteous; he will converse freely



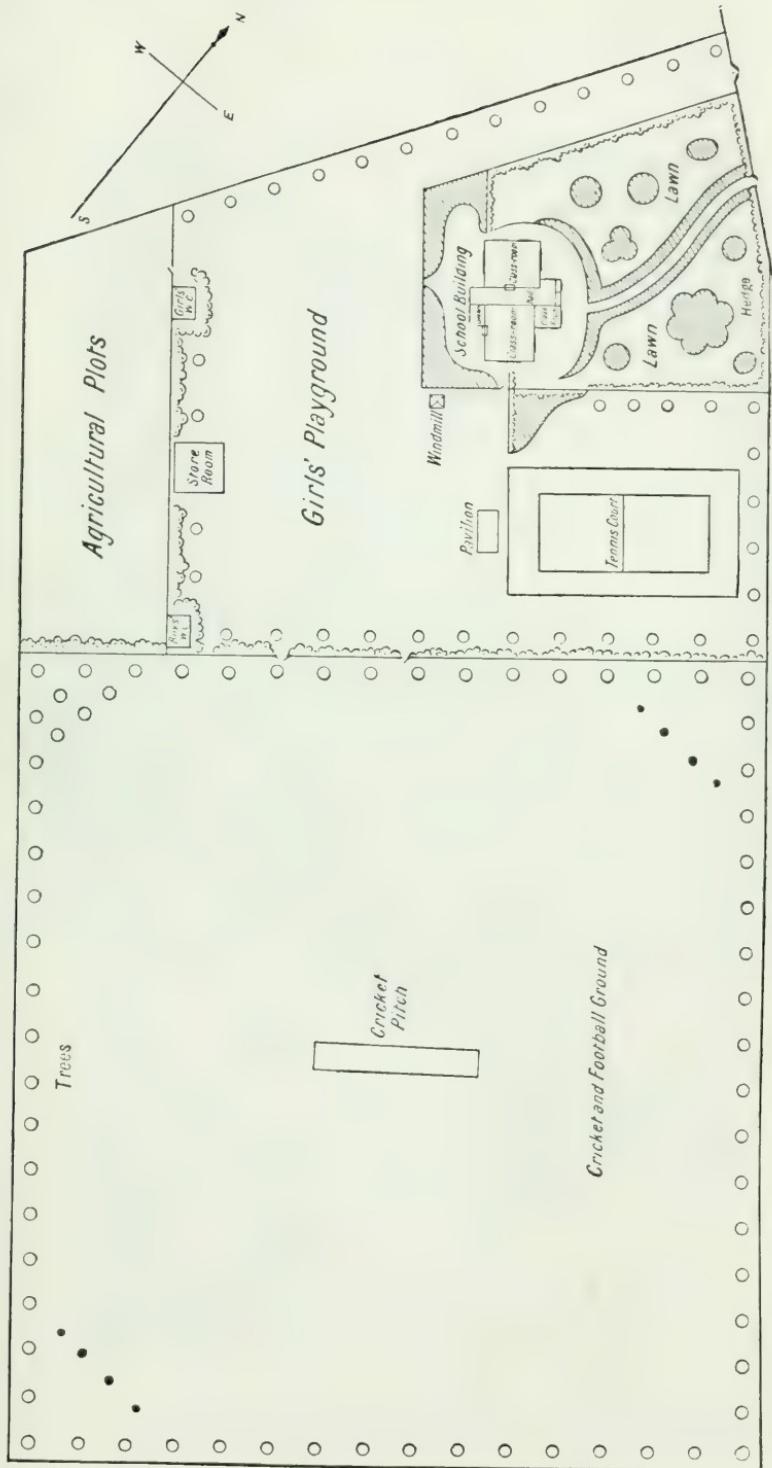
SCHOOL AT BULN BULN, GIPPSLAND.

and well on ordinary topics; he is easily managed and truthful, responsive and intelligent. In the whole field of education in Victoria, there is no portion of which we are more legitimately proud than our small country schools.

The attendance at town schools varies from 150 to upwards of 1,000. The main features of large elementary schools have necessarily much in common everywhere. The prescribed program, in accordance with modern views, is rich and varied. Efforts are made by means of summer schools and teachers' conferences, in addition to at least two inspectorial visits to each school every year, to keep the teachers in touch with recent

Town Schools. developments and tendencies, here and elsewhere. Drawing,

Physical Training and Hygiene, Manual Training and occupations, including Needlework and Cookery (for girls) and Nature Study have all received special attention and encouragement during the last decade. Swimming is taught in 171 schools, and for this subject



GENERAL PLAN OF GROUNDS OF A RURAL SCHOOL.

special instructors have been appointed : over 7,000 children annually receive instruction, and of these over 2,000 children learn to swim during each year.

In some of the subjects prescribed alternatives are provided at the option



ELEMENTARY SCHOOL, CANTERBURY.

of the teacher. Drawing with the pencil and the brush is taught in all schools, and at least one of the following subjects :—Modelling, stencilling, leather work, repoussé work, chip-carving, wire work, &c. Needlework is taught to all

girls except those in small country schools where a male teacher is in charge. Cookery is taught in the larger centers by special teachers. The system of teaching cookery is that a class of sixteen girls spends one whole day per fortnight in a cookery center. The girls first have a class lesson, and then set to work to prepare a meal which is served in a dining-room attached to the center. These meals are sold to the public, and so popular are they that the centers cannot provide meals for all who wish to attend. Each class receives twenty full days' instruction in the year, and there are ten classes in attendance at each center. The sloyd classes are organized on the same lines, but the attendance at each class is twenty-five, and the time of instruction given to each class is one half-day every week, or one day in each fortnight for classes that come from long distances. Exclusive of 65 country schools where teachers are qualified to teach woodwork, upwards of 6,500 boys receive weekly training in sloyd woodwork, and 3,600 girls in cookery.



INFANT SCHOOL AT PORT MELBOURNE.

There are teachers who declare that with the broadening of the curriculum there has been some sacrifice in the so-called fundamentals—reading, writing, and arithmetic. On the whole, teachers have undertaken the new work enthusiastically. A beginning has been made in the system of medical inspection of schools, and a few years ago three full-time medical officers were appointed. There is at present a strong demand for the extension of the system of medical inspection.

The infant school is a special department in all large town schools. The work in the infant rooms is based on Kindergarten principles, and recently some experiments have been made with the **Infant Schools.** methods of Dr. Montessori. The teachers are specially trained at the Teachers' College for the work, and a special certificate—the Infant Teacher's Certificate—is gained by those who complete the course, which extends over two years. The illustrations

show an infant school attached to one of the Melbourne schools and a Kindergarten class in the large hall which forms part of each infant school.



KINDERGARTEN CLASSES IN THE HALL OF AN INFANT SCHOOL.

The Special Schools either supported by, or receiving grants from, the State for education, are the Victorian Institute for the Blind, the Victorian Deaf and Dumb Institution, the Neglected Children's Home, **Special Schools** Orphanages, schools for the Feeble Minded, and the seventeen free Kindergartens affiliated with the Free Kindergarten Union of Victoria.

The majority of the teachers enter the service of the Department as junior teachers. Junior teachers are appointed to schools after completing the course in district high schools and are paid on the following scale :—

Training of Teachers.	First year—Third class	£40
	Second year—Second class	50
	Third year—First class	60

During the three years, they are required to pass examinations in the theory and practice of teaching, in drawing, and in any subjects of the high school course in which they have not secured a pass before being appointed. To enable them to pass their annual examinations, evening classes and tuition by correspondence are provided free. In addition, the head teachers of the schools to which they are attached are required to make arrangements so that they will receive instruction from the staff. On completing the course as



THE TEACHERS' COLLEGE, UNIVERSITY GROUNDS, CARLTON.

First class junior teachers and passing the prescribed examination they are awarded the Second Class Certificate, and are entitled to classification as teachers. They are also entitled to compete for admission to a further course of training at the Teachers' College, where the following courses of training are provided :—

1. Infant Teacher's Certificate Course (two years).
1. Trained Primary Teacher's Certificate (two years.)
3. Diploma of Education (Secondary Teachers) (three years).

According to the Annual Report of the Department for the year ended 30th June, 1913, 702 elementary school teachers (out of a total of 3,730) then held the Trained Teacher's Certificate or some higher qualification.

The course of the Diploma of Education is taken at the University, in a portion of the grounds of which the Teachers' College is situated. The other courses are given at the College and at practising schools associated

with it. During 1913 there were in all 111 departmental teachers in training at the College, and the cost for that year amounted to £9,149. It should be added that the students receive allowances for board and personal expenses while they are in training, and these allowances accounted for £4,702 of this sum.

(c) **Registered Primary Schools.**

Prior to and since the inception of the State system of control of national education there have been schools other than State schools, but until the passing of the *Registration of Teachers and Schools Act* in 1905 practically no supervision was exercised over them by the State. They were required by law to keep attendance rolls supplied by the Education Department and some effort was made to secure regularity of attendance, but there was no system of inspection of the schools and no examination of the children. The *Registration Act* produced a great change, and, as an educational experiment, it is probably unique.

**Registered
Primary
Schools.**

Under the provisions of this Act it was made unlawful for an unregistered teacher to teach in a school, and every school had to be registered by a date which was proclaimed. A penalty up to £50 was prescribed for non-registration. Schools were registered as sub-primary, primary, or secondary, or in two or in all divisions according to the standard of work done in them at the time. Teachers were registered as sub-primary, primary, secondary, or as teachers of special subjects, according to the work they were doing. A Board was appointed to carry out the provisions of the Act, which provided that all persons who had taught in Victoria prior to its passing were entitled to registration, provided that applications were made within a prescribed time. Having classified and registered existing schools and teachers, the Board proceeded to prescribe courses of education and training to be required from future applicants. To secure registration as sub-primary or as primary teachers, applicants are now required to give evidence of having received a secondary education practically up to the standard required for admission to the University, and this must be followed by a course of training extending over one or two years. In this way it is assured that all persons now entering on the work of teaching in elementary schools are properly qualified for this work, and the community is to this extent protected from education by the unfit. In addition, the registered primary and sub-primary schools are regularly inspected by inspectors of the Education Department. The buildings of all registered schools are also inspected by the Public Health Department, and must conform to certain prescribed standards as regards lighting, ventilation, sanitation, and general suitability for school purposes. In the five years after the passing of the Registration Act a large number of buildings in which schools had been conducted for years were closed as being insanitary or unsuitable, the others were either approved or re-modelled to meet the requirements. In this connexion it should be remembered that these schools do not receive grants, nor are their training colleges for teachers subsidized in any way by the State. The position practically is this: The State schools are regarded as the national schools where education is free and secular. Parents desiring

to send their children to other schools may do so, but such schools must be registered; the teachers therein must be registered also, and the regularity and efficiency of the instruction provided for pupils between the ages of 6 and 14 years must be certified by the district inspector after inspection.

The number of children in attendance at registered schools for the year ended 30th June, 1913, was 57,698. Of these, 10,000 may be regarded as having attended secondary schools. There were thus 47,698 attending registered primary schools as against 209,172 attending State elementary schools, or 18·6 per cent. of the total school population attended registered primary schools. In that year there were 519 registered primary schools in the State, and 4,928 registered primary teachers, though a large percentage of the latter were not teaching in registered primary schools.

As regards the Roman Catholic schools, which constitute a large proportion of the registered primary schools, it should be mentioned that the authorities of that church have their own system of inspection and examination of their schools, which is additional to the inspection made by the Government. They urge that they cannot conscientiously avail themselves of the secular education given in the State schools, and that religious instruction is essential to sound education. Under the stress of this conviction the adherents of that church have made heavy personal sacrifices to maintain their own schools. In the Melbourne district they maintain 110 primary schools, with an enrolment of 24,463 pupils, 37 high schools, with 4,572 pupils, and two training colleges for teachers, in which there are 89 students in training; in the Ballarat district, 56 primary schools, with a total enrolment of 5,099 pupils; in the Sale district, 11 schools, with 850 pupils; and in the Bendigo district, 31 primary schools, with an enrolment of upwards of 3,500 pupils. In all they maintain 288 registered primary and secondary schools, with a total enrolment of 39,570 pupils.

2.—Secondary Education.

(a) Under State Control.

Prior to the passing of the Education Act of 1910 there was no public system of secondary education in Victoria. Up to that time almost the whole effort of administration was directed to the development of the elementary system, which, when the time for expansion came, proved to be a broad and sound foundation on which to build. The provision of secondary education in Victoria and all arrangements with regard to it had been left to private enterprise or to endowed schools under the control of religious bodies. Technical schools were given grants and inspected, and, under the heading of "Extra Subjects," taught for fees in State schools by the ordinary teachers, some instruction of a higher elementary character was given in the State primary schools.

From 1871 to 1892 there were exhibitions or scholarships provided by the State, and awarded on competitive examination to the cleverest pupils in attendance at the State elementary schools to enable them to proceed first to approved secondary schools and then to the University. In 1892 these scholarships were discontinued owing to retrenchment, but the system was revived in 1904 and still continues, and the number and value of the scholarships have been very considerably increased. Under the present regulation

(October, 1913) the Minister of Public Instruction may annually award 180 scholarships; of these, 120 are tenable under certain conditions for four years at a district high school or approved secondary school. They are awarded on competitive examination to children under 14½ years of age, and have a value of £8 per annum, with additional travelling or boarding allowance where necessary. Of the 120 scholarships referred to, 100 are open to pupils in attendance at State primary schools, and 20 to pupils in attendance at registered primary schools. The remaining scholarships are intended for pupils intending to join the teaching service of the State, and are tenable for two or four years with free tuition at a district high (State secondary) school. The conditions for approval of non-State secondary schools are that they provide a qualified staff, suitable premises, buildings, and equipment, and have classes in attendance taking courses suitable for pupils leaving school at 18½ or 19 years of age. At the end of the course in the secondary school, scholarship holders are eligible to compete for exhibitions tenable for four or five years at the University.

In 1905 the first district high school, or continuation school as it was then styled, was opened in Melbourne. Its principal object was to train teachers for the State primary schools. During the next few years a few State secondary schools called agricultural high schools were opened in provincial centers. In addition to the object mentioned above, these schools aimed at giving an education which would attract pupils to agricultural and rural pursuits. Under the provisions of the Act of 1910 Parliament definitely adopted the principle of State secondary education and increased activity of the Department in this field was immediately apparent. Courses of study were issued suitable for pupils from 12 to 16 or 18 years of age. For the first two years there are what are termed the Common Course, which includes a second language, and is intended for pupils who remain for a further period of at least two years, and the Industrial Course, intended for those who leave at about 15 years to enter upon some form of trade work. For those who remain after two years a choice of courses is allowed. In all the schools a purely Secondary course is provided, and, in addition, one or more of the following courses—Agricultural, Commercial, Domestic Arts. At the present time there are in operation 22 district high schools, attended by nearly 3,000 pupils, 1,543 boys and 1,444 girls. In addition, there are 18 higher elementary schools, which also provide the four years' courses mentioned above. These are attended by upwards of 1,500 pupils. Of the district high schools, 10 are agricultural high schools. The purpose of the district high schools and the higher elementary schools is to provide the essentials of a good general education for pupils who have completed the work of Grade VI. in elementary schools and are likely to profit by a further course of study, and to give them, in the third and fourth years, a specialized training that will help to prepare them for their several careers in life. These schools will thus link the elementary school to technical institutions, or the University, or to vocations that may be followed by pupils upon the completion of the course of study.

The Melbourne High School, with an enrolment of 651 pupils, is the largest district high school. The majority of the pupils in attendance there aim at becoming teachers or entering the State or Commonwealth public services.

The Ballarat Agricultural High School, in addition to providing a secondary education, gives special attention to agriculture for boys and to domestic arts for girls. The accompanying photograph shows the school at Ballarat. The farm, of 75 acres, adjoins the school.

Recent returns (July, 1913) show that, of the pupils at present in attendance at district high schools and higher elementary schools, 2,302 are taking the Common Course, 266 the Industrial Course, 1,776 the Secondary Course, 59 the Agricultural Course, and 108 the Commercial Course. The greatest demand is for the Common Course followed by the Secondary Course, but it is expected that the Industrial Course followed by a course in a technical school and the other more directly vocational courses will ultimately attract the greatest number of pupils. Pupils who leave the elementary schools at 14 or 15 years of age are to be provided for by evening continuation classes, and the Governor in Council is given power to make attendance at these



AGRICULTURAL HIGH SCHOOL, BALLARAT.

evening classes for not more than six hours a week compulsory for boys. These evening classes are only beginning, and much is expected of them as the work develops.

The high schools are staffed in the main by teachers holding degrees or the Diploma of Education of the University of Melbourne. This was made possible because for many years the Department has had the right of nominating a certain number of its teachers for free courses at the University. In 1911 there were 120 teachers of the Department in attendance at courses at the University. Most of the teachers in high schools and higher elementary schools have thus had successful experience in primary schools before taking up the higher work. When high schools were opened in the neighbourhood of private secondary schools which had been established for some years the teachers in those schools, provided they possessed the necessary teaching skill and qualifications, and desired to enter the service of the State, were

appointed to posts in the high schools. Education at higher elementary schools is free. In high schools a fee of £6 per annum is charged to pupils over 14 years of age.

(b) Registered Schools.

Until the passing of the *Registration of Teachers and Schools Act* in 1905 statistics were not available with regard to either the number of secondary schools or the number of children receiving secondary education in Victoria. As has been mentioned, this Act provided that all teachers in schools other than State schools must be registered by a fixed date, but any one who had taught in Victoria prior to the passing of the Act might be registered on giving evidence of this. Those who wished to become teachers, and who had not taught prior to the passing of the Act were required to give evidence of having had a general education up to some prescribed standard, and, in addition, of having undergone a prescribed course of training. The standard that has been required for some years for registration as a secondary teacher is that the applicant must possess the Diploma of Education of the University of Melbourne or an approved equivalent qualification. To obtain the Diploma of Education it is necessary to pass the prescribed examinations for two years of any course at the University, and subsequently to spend one year in training. Of upwards of 1,700 teachers registered as secondary, the majority are so registered in virtue of having been employed in teaching prior to the passing of the Act. As all registrations are now made in virtue of candidates having the Diploma of Education, those possessing the higher qualification will soon constitute the majority, and ultimately all registered secondary teachers will have this or some equivalent qualification.

There are 177 registered secondary schools in Victoria. The standard required for registration of a school as secondary is that secondary teachers are employed, and classes are in attendance taking a course of study up to the standard required for matriculation at the Melbourne University.

The passing of the Registration Act was due mainly to the advocacy of the teachers in secondary schools, who urged that the nature of the services these schools rendered to the community was too important to be left without any form of State supervision, and at the same time hoped that a system of registration would raise the professional status of teachers in the schools. The system has undoubtedly helped to prevent many persons from establishing schools who, when driven by untoward circumstances to make a living, would otherwise have resorted to school-keeping in the belief, formerly prevalent, that this required little capital and no special qualifications.

Many of the registered secondary schools are private schools, but the majority are denominational. With the spread of State high schools, there has been a marked tendency on the part of the proprietors particularly of girls' schools to have their schools attached to some religious denomination. In many of the country towns will be found a convent high school in addition to the Roman Catholic parish (primary) school. The number of convents at present imparting higher education in the State is 61. Of the various

religious orders of nuns, the Sisters of Mercy conduct the greatest number of Roman Catholic schools. Seeing that until 1910 the field was free from State competition, it is not surprising that some of the older denominational schools should by this time have gained strong support in the community. At the head of the secondary schools for boys stand what are known as the six public schools of Victoria. They were established soon after the incorporation of the Melbourne University, partly as recruiting grounds for its classes. These are the Scotch College (opened 1854), Geelong Church of England Grammar School (1858), Melbourne Church of England Grammar School (1858), Wesley College (1866), St. Patrick's College (1854), which has since waived its claim in favour of Xavier College (1878), and Geelong College (1861). English models and traditions have very largely influenced these schools, and there has been a conscious aim to imitate the English public schools in their government by councils, their internal organization, their customs, their ideals, and their old boys' associations.



XAVIER COLLEGE, KEW.

When these schools were founded education was mainly controlled by the Denominational Schools Board, 1849–1862, and the Board of National Education, 1851–1862. The State then made large grants of money and land in support of their establishment. In 1853 the sum of £20,000 was voted for grammar schools, and of this sum £10,391 17s. fell to the Church of England. Two years later a second grant of £15,000 was made by the State. The total amount received from the State towards the building of the different grammar schools was :—

Church of England Grammar School, Melbourne	..	£13,784
Church of England Grammar School, Geelong	..	7,000
Scotch College, Melbourne	..	6,445
Wesley College, Melbourne	..	2,769
St. Patrick's College, Melbourne	..	2,500

With the exception of Geelong College, each of the six public schools also received from the State a grant of land as a site for a secondary school. These grants of land varied in size, and appear to have been given subject only to the condition that "a grammar school should at all times be maintained on the land" in each case, and, except for the purposes of registration or for approval for the attendance of holders of scholarships granted by the State, the public schools and the other registered secondary schools have never been subject to inspection. In the 50 years of their existence the public schools have had a marked influence on the history of the State, and at the present day they are the leading secondary schools for boys. They are staffed almost wholly by secondary teachers—nearly all graduates of leading Universities. They have well-equipped buildings and large grounds, and besides being imbued with keen intellectual alertness and effort, they have developed a fine corporate life to which their prefect system, their inter-school contests in football, cricket, rowing, shooting and athletics, and their interest in games and military drill, have contributed very much. The pastoral work of the teacher is emphasized here, special attention being given to character training, for which the system adopted helps very much by developing an attitude of independence and self-reliance in the pupils. As an illustration of the strength of the sentiment that is attached to these schools, the case of Geelong Grammar School may be mentioned. For many years it was felt that the site of this school—an area of five acres in the heart of Geelong—was inadequate, and that the buildings erected half a century before were unsuitable as regards modern requirements for schools. The old boys of the institution accordingly, acting in conjunction with the School Council, decided to remove the school to a more suitable site. A fund for the purpose was opened, and to this £39,253 has been subscribed, mainly by old boys. An additional amount has been promised, and £21,700 has also been subscribed in debentures. An area of 260 acres of land about five miles from Geelong was purchased. On this site the school is being built, and will be opened in February, 1914. The site is an ideal one for a school, as it adjoins a sheltered bay, and thus provides facilities for rowing and swimming. Though removed from the city it is still accessible by train, road, and boat, and it has ample space for future expansion, a picturesque situation, and a healthy climate. The illustration on page 125 gives a general view of the school now in course of erection.

The denominational system of secondary schools has spread, and grammar schools for boys belonging to the Church of England and the Presbyterian Church have recently been opened in Ballarat, where also the Christian Brothers conduct the largest boarding school in Victoria for boys. The order of the Christian Brothers also conducts large secondary schools in Melbourne. The various denominations have established many secondary schools for girls. Those established by various religious sisterhoods attached to the Roman Catholic Church are by far the most numerous, the largest being the Catholic Ladies' College, East Melbourne (Sisters of Charity), 296 pupils; the Presentation Convent, Windsor (Presentation Nuns), 213 pupils; and Convent of Mercy, Fitzroy (Sisters of Mercy), 282 pupils. Other large girls' schools are the Church of England Girls' Grammar School, the Presbyterian Ladies' College, and the Methodist Ladies' College—all of

Melbourne. Besides these schools for boys and girls, there is a large number of private secondary schools, some of which are well organized



CHURCH OF ENGLAND GRAMMAR SCHOOL, GEELONG.
[NEW BUILDINGS.]

and conducted, but the majority do not attain a high standard of achievement or secure large enrolments of pupils taking work beyond the primary stage.

The main objective of all the registered secondary schools is to provide a course of education leading up to the University. Apart from the method of control and the amount of fees, they differ from the district high schools established by the State in the following particulars. Nearly all the registered secondary schools admit either boys alone or girls alone as pupils: in the district high schools both sexes are admitted. In practically all the registered secondary schools formal religious instruction forms part of the course; this is not so in the case of the



METHODIST LADIES' COLLEGE, KEW.

district high schools, except as provided in the regulations permitting visiting clergymen to undertake the work voluntarily. In the chief registered secondary schools there is greater continuity of service in the staff of any one school than in the district high schools, where greater opportunities of promotion exist. In their curricula the district high schools are much more distinctly vocational than is the case in the registered secondary schools. The number of pupils in attendance at the registered secondary schools is estimated to be about 10,000, as against about 4,500 in State secondary schools.

The extension of State control over secondary education through the establishment of State high schools, and by means of the system of registration has raised many interesting and complex problems. Many registered

secondary schools have been closed through the opening in their neighbourhood of the State high schools, which are more liberally staffed, better equipped, and for attendance at which either no fees or very low fees are charged. It has been questioned whether, in providing the extension of facilities for higher education, existing institutions might not have been utilized, so that expense to the State might be minimized, and also at the same time different types of schools be encouraged by means of a wide extension of the scholarship system under which existing institutions would be utilized for the purposes of higher education. Hitherto this view has not found much favor here, though with the prevailing system of public supervision of all educational institutions the arguments in favor of giving the State a monopoly of secondary schools are less cogent than in countries where there is complete immunity of such schools from public supervision. The chief danger in the way is that religious denominations may be subsidized through the schools. The proprietors of registered secondary schools regard further extension of State control with some misgiving, partly because in the past the chief influence on their work has come from the University through the system of public examinations taken by pupils in secondary schools, partly because they fear that their independence may be affected, and partly because they regard the recently established and rapidly growing State secondary schools as rivals.

The system of registration as developed in Victoria, while securing the intellectual and moral autonomy of the schools, and giving to each freedom to develop along the lines of its own capacity and instinct, has at the same time subjected them to sufficient guarantees for the efficient discharge of their functions by endeavouring to secure competence in the teachers, and due regard to reasonable requirements as to school hygiene.

3. — Technical Education.

Of late years increased interest has been shown in technical education in Victoria, and the *Education Act* of 1910 was passed mainly to provide continuous education leading up to the technical schools. On leaving the elementary schools at the age of 14 years, pupils may enter either a preparatory technical school, a higher elementary school, or a district high school, or, if they go to work, they may attend evening classes at continuation schools. Much of this system is still in the process of early development, but a good start has been made, and as funds are made available the work is being extended. The first State preparatory technical school was opened in Melbourne in February, 1912, and there are already over 400 boys in attendance there. Since then three other preparatory trade schools have been opened in Melbourne, and others in the larger country centers. The course for day pupils in these schools includes English, Civics, Geography, Mathematics (including Mensuration), Geometrical Drawing and Development, Freehand Drawing, Modelling, Woodwork, Sheet-metal Work, and Elementary Science. Besides the pupils in full attendance, classes of boys from 13 years of age upwards from

the State elementary schools attend on three afternoons per week for instruction in some form of manual work, the object of this being to lay a foundation for future technical work, and at the same time to capture their interest in technical work before they leave the elementary school, so that they will probably desire to attend evening classes when they leave the elementary school to enter upon some wage-earning occupation. The junior technical schools and the evening continuation classes are maintained wholly by the State. In addition to these there are twenty technical schools governed by local councils and receiving grants from the State. Of these 3 afford instruction in Art, Science, and trade subjects, 3 in Art and Science, 3 in Art and trade, 6 in either Art or trade, and 6 have full courses in Metallurgy and Mining Engineering extending over three or four years, in addition to day and evening courses in Art, Science, Trade, Commercial, and special subjects.

The total expenditure by the Education Department in connexion with technical schools for the year ended 30th June, 1913, was £49,139. In students' fees £11,664 was received, and in subscriptions and donations £2,690. The number of students in attendance was 9,200. The only technical school for the training of women is the College of Domestic Economy, in Melbourne, where there are 220 students. Connected with this is a hostel for the training of women as teachers of Needlework, Cookery, and Domestic Arts in elementary and high schools. The largest technical institution in Victoria, and the parent of many of the others, is the Working Men's College, in Melbourne, where there are upwards of 4,000 students in attendance. This institution was founded in 1887, and receives a grant of £11,000 per annum from the State, and technical work of advanced character is carried on. Over 180 classes are in attendance, and courses in Engineering Construction, Hydraulics, various branches of Technical Chemistry, Metallurgy and Assaying, Geology and Mineralogy, Mine and Land Surveying, Applied Mechanics, Steam and Gas Engines, Electrical Appliances, Mathematics, Commercial Work, &c., are supplied. In Art subjects instruction is given in Plane and Solid Geometry, Perspective Drawing, Architecture, Building Construction and Drawing, Engineering Drawing, Ornament, Nature Forms, Still Life, Design, Historic Ornament, Brush Drawing, &c. In trade subjects very large numbers of artizans and apprentices attend for theoretical and practical work in Carpentry, Turning, Fitting, Moulding, Casting, Blacksmithing, Printing, Wool-sorting, House Painting and Decoration, and other trade subjects. These courses of work extend over four or five years. In regard to technical education, something has been done, but very much more remains to do.

The chief hope for the future is not in our present achievement, though that is not inconsiderable, but in the consciousness of the community of our present shortcoming, in its clear realization of the fact that the foundation of power and prosperity depends on technical pursuits, and in its determination to add to the training of our young citizens in the rights and duties of good citizens a technical training that will enable them to become skilled workers and more efficient producers.

The illustration shows the front of the School of Mines—the chief technical school—at Bendigo.



SCHOOL OF MINES, BENDIGO.

4.—The University of Melbourne.

The crown of our educational edifice is the Melbourne University. In the work, standing, and influence of this institution Victorians have legitimate reason to feel a pride. It says a great deal for the wisdom of our pioneers that in the early "fifties," when the gold fever was at its height, the establishment of a University was undertaken. Largely as the result of the advocacy of Mr. H. C. E. Childers, a Cambridge graduate, and the first Inspector of Schools in the Colony, subsequently prominent as an English statesman, the University of Melbourne was incorporated and endowed by an Act to which the Royal assent was given in 1853. An annual endowment of £9,000 was granted by the State, and 106 acres were reserved for the purposes of the University and affiliated colleges. The foundation stone was laid in the following year, and in 1855 the University of Melbourne was formally opened with a staff of four professors and sixteen students. Letters patent recognising its degrees as entitled to rank with those of any University in the United Kingdom were granted in 1859. From a small beginning our University has developed with the State, sharing both its prosperity and its adversity. To-day it has a staff of 18 professors, over 60 lecturers, demonstrators, and assistant

demonstrators, and 1,200 students attending lectures. Since its inception nearly 5,000 degrees have been conferred by the University.

There are in attendance at the University over 9 students per 10,000 of population, as against about 5 per 10,000 which is given by Paulsen as the number of students attending the Universities in Germany and the countries of similar culture conditions.

The University of Melbourne is governed by a Council and Senate. The Council consists of twenty members elected by the Senate for a term of five years, and three members appointed by the Governor in Council to act for a similar term. From its members it elects a Chancellor and a Vice-Chancellor. The present Chancellor is the Hon. Sir John Madden, G.C.M.G., B.A., LL.D., D.C.L., the Chief Justice of the Supreme Court of Victoria, who has been continuously elected a member of the Council since 1879; the Vice-Chancellor is J. H. MacFarland, M.A., LL.D., the Master of Ormond College, who has been a member of the Council since 1887. The Senate consists of all persons—men and women—who have graduated Doctor or Master in the University, and this body elects one of its members as Warden or Chairman of the Senate annually. The present Warden, T. P. McInerney, M.A., LL.D., has filled this office since 1890. The general control and management of the University are in the hands of the Council, while the Council and Senate conjointly make statutes and regulations. The Council is advised on educational questions by the Professorial Board and the Faculties.

There is no religious test for admission to the University, nor are courses in any theological subjects given there. Scholarships, exhibitions, and prizes are awarded in all the principal subjects of study, and research scholarships are given annually. The cost of these awards is defrayed partly out of the University funds and partly by private bequests, while a portion of the annual State grant is given for research scholarships. In the matter of endowment by private persons, the Melbourne University does not compare favorably with other Universities. The principal benefactions made since its foundation are those of John Hastie (1873), £19,140; Sir Samuel Wilson (1875), £30,000; Francis Ormond (1887), £20,000; and James Stewart (1909), £25,624. The total amount of benefactions received in nearly sixty years is somewhat less than £166,000. In the same period the Government grants have amounted roughly to £950,000. The annual Government grant at present amounts to £27,500, and in addition special grants are occasionally made for buildings. The Council is keenly conscious of difficulties, arising largely from the fact that the number of students in attendance has nearly doubled during the last four years, and they have asked the Government to provide a special grant of £105,000 for buildings, and an added £16,000 to the annual grant for salaries and maintenance. Degrees are granted in Agriculture, Arts, Civil Mining and Mechanical Engineering, Law, Medicine, Music, Science, Surgery, Dental Science, and Veterinary Science, and Diplomas for shorter courses in Analytical Chemistry, Architecture, Education, Metallurgy, Mining and Public Health. For these courses the fees range from 12 to 24 guineas for each year; the amount received from this source and from examinations being upwards of £21,000 yearly.

In the course of years many buildings have been erected for University purposes. The first to meet the eye in the main entrance is the Wilson Hall, shown in the illustration, and used chiefly for social purposes, for meetings of the whole University, and for examinations.



WILSON HALL, MELBOURNE UNIVERSITY.

The various schools have their main lecture-rooms and laboratories grouped artistically in blocks of buildings placed round a small artificial lake in the middle of the grounds. The main buildings are the administrative offices, Library and Arts School, the Students' Club Rooms, the Medical School, the Biological School, the Chemistry School and Agricultural Science Laboratories, the Engineering School, and the Conservatorium of Music. The Veterinary School is on a special piece of ground adjacent to the University. The residences of the professors are also in the grounds. A cricket and sports ground and tennis courts are provided there, and the head-quarters of the University Boat Club are on the Yarra, about a mile distant. Connected with the University and the affiliated colleges are numerous

societies, some of which are chiefly social in character, and others connected with literary and scientific pursuits. The Union and the Sports Club are the most important of these. The University Extension Board conducts short courses of lectures in metropolitan and country centres, and in a small way endeavours to extend University influence and teaching. The graduates have recently formed a University Association for promoting the interests of the University, and there is also a University Club for social purposes, whose rooms are in Swanston-street.

In 1912 there were in attendance at lectures 1,319 students, of whom 1,009 were men and 310 women. In 1904 there were 615 students. Of the total in 1912, 420 were students in Arts and Education, 390 in Medicine, 130 in Laws, 74 in Engineering, 84 in Dentistry, 35 in Science, 27 in Veterinary Science, 26 in Agricultural Science, 98 in Music, 31 were doing Science Research Work, and the remainder were taking other courses. The degrees, diplomas, and licences granted during the year were distributed as follow :—

Bachelor of Arts .. .	29	Bachelor of Veterinary	
Bachelor of Science .. .	19	Science .. .	6
Bachelor of Laws .. .	14	Master of Arts .. .	21
Bachelor of Medicine .. .	22	Master of Science .. .	5
Bachelor of Surgery .. .	23	Master of Laws .. .	2
Bachelor of Civil Engineering .. .	9	Master of Surgery .. .	2
Bachelor of Mining Engineering .. .	2	Master of Civil Engineering .. .	1
Bachelor of Mechanical Engineering .. .	1	Doctor of Science .. .	3
Bachelor of Music .. .	2	Doctor of Medicine .. .	15
Bachelor of Dental Science	13	Diploma of Music .. .	3
Bachelor of Agricultural Science .. .	1	Diploma of Education .. .	33

The total receipts of the University for that year amounted to £76,730, and the expenditure to £73,842.

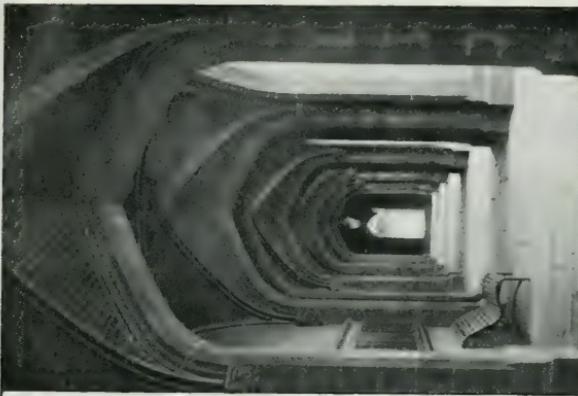
The question of readjusting the organization of the University in order to ensure that it may promote more fully the highest interests of University education in the State has received considerable attention during recent years. At the present time schemes for materially altering the present relative powers and the constitution of both Council and Senate, and for improving the buildings and accommodation in order to provide greater facilities for teaching are under consideration. These proposals involve fundamental changes in the machinery of government of the University. It is proposed that the Council, while retaining its present powers, shall be constituted on a different basis so as to secure definite representation of different interests. An increase in the number of nominated representatives and a decrease in the number of those elected by the Senate are suggested.

The Melbourne University has been, since its foundation, almost entirely a teaching institution, where students receive systematic and personal instruction under the guidance of lecturers and professors. It has never aimed at being merely an examining body for external students, nor has it

delegated its teaching functions by granting recognition to the work done in other institutions. Though attendance at lectures has never been made compulsory except in certain professional courses, such attendance has in fact been the custom in almost all cases. As a consequence, the students have always worked in close and constant intercourse with each other, and with their teachers, so that a fine corporate University spirit has been developed. Until recently, when a departure was made, chiefly in connexion with the course for the Diploma of Education, practically all the students were required to give their whole time to University training, of which they thus secured the full benefit.

The entrance examinations of the University are attended by upwards of 3,000 candidates each year. The matriculation examination many years ago came to serve a dual purpose, and was regarded both as an examination for admission to the University and as a secondary schools leaving examination for pupils not proceeding to the University. In order that the latter purpose might be more adequately fulfilled, the matriculation examination was considerably modified about seven years ago, and four examinations were then substituted for the single examination previously conducted. These examinations have undoubtedly had a very good influence in raising the standard of secondary education, but it is now realized that, no matter how carefully they are conducted, such a system is not educationally sound, and that certain evil effects follow from an elaborate system of purely external examinations of the work of schools. In order to provide a remedy, and with the further object of bringing the secondary schools and the University into closer co-operation, a University Schools Board consisting of representatives of the University, the secondary schools and the Education Department, was appointed in 1912. That body, which has general control of the examinations referred to above, recently made proposals for partly supplanting the present examination system by a system of schools' inspection under which in the granting of Intermediate and Leaving Certificates a large measure of recognition will be given to internal examinations conducted by schools which have been approved after inspection. It is also proposed to raise the minimum age for entrance to the University from 16 years to 17 years.

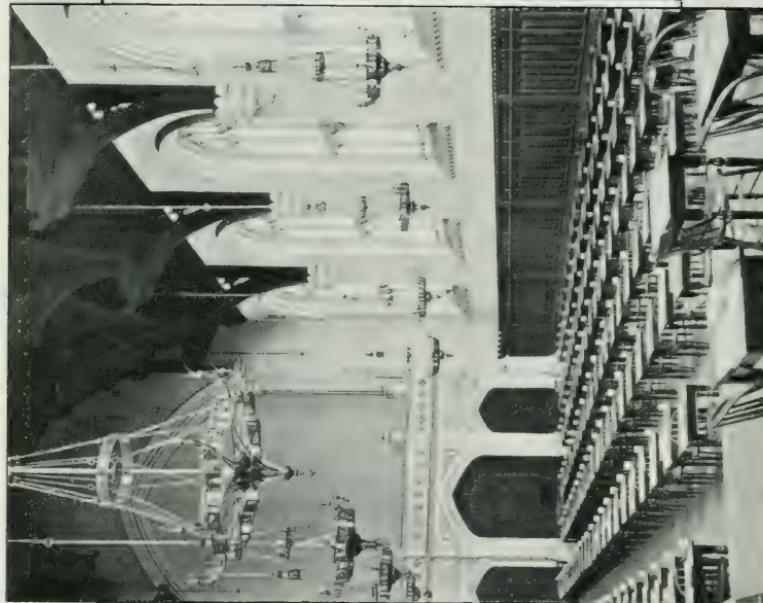
As in other Universities a great deal of important work in this University is done by Boards and Faculties. The professors form the Professorial Board, which considers questions relating to studies and discipline in the University, reports on questions referred to it by the Council or by any Faculty or by the Schools Board, prescribes books and details of subjects for courses within the University, and so on. The President of the Professorial Board, who is required by statute to perform many important executive duties, in some respects acts as Principal of the University. The present holder of this office is Professor Orme Masson, M.A., D.Sc., F.R.S.E., F.R.S. who is also Chairman of the local Committee of the British Association. There are Faculties of Law, Medicine, Engineering, Arts, Science, Agriculture, Veterinary Science, and Dentistry. These consist of professors, independent lecturers, and other members appointed by the Council. Each Faculty considers questions relating to the educational and administrative business of the Faculty, advises the Professorial Board on matters referred to it, and carries out the special duties imposed on it by statute and regulation.



THE CLOISTERS,
MELBOURNE UNIVERSITY.

INTERIOR OF WILSON HALL,
MELBOURNE UNIVERSITY.

A GARDEN WALK,
MELBOURNE UNIVERSITY.



Affiliated Colleges.

The establishment of affiliated denominational colleges for resident students was permitted by the *University Act of Incorporation* and grants of land within the University grounds were made by the State for such institutions when established by the Church of England, the Presbyterian Church, the Methodist Church, and the Roman Catholic Church respectively. The large residential colleges, built and controlled by the three first mentioned churches, are a special feature of our University life. Their main objects are threefold, namely, to provide residence for undergraduates and graduates, to supplement University lectures by tutorial classes, and to provide theological training and instruction for students intending to enter the ministry of their respective churches. All these colleges admit students without regard to their religious belief, and have non-resident as well as resident students and tutors. In the case of these colleges, "affiliation" with the University does not imply that any exemption from attendance at University lectures or laboratory work is granted to students in the colleges. They are recognised by the University for the boarding of students, but the University has neither voice in their management nor control over their teaching. There appears to be no possibility of rivalry or friction between these colleges and the University; on the other hand, they do much to foster *esprit de corps* and help the University in every way, especially in supplementing lectures by means of small tutorial classes.

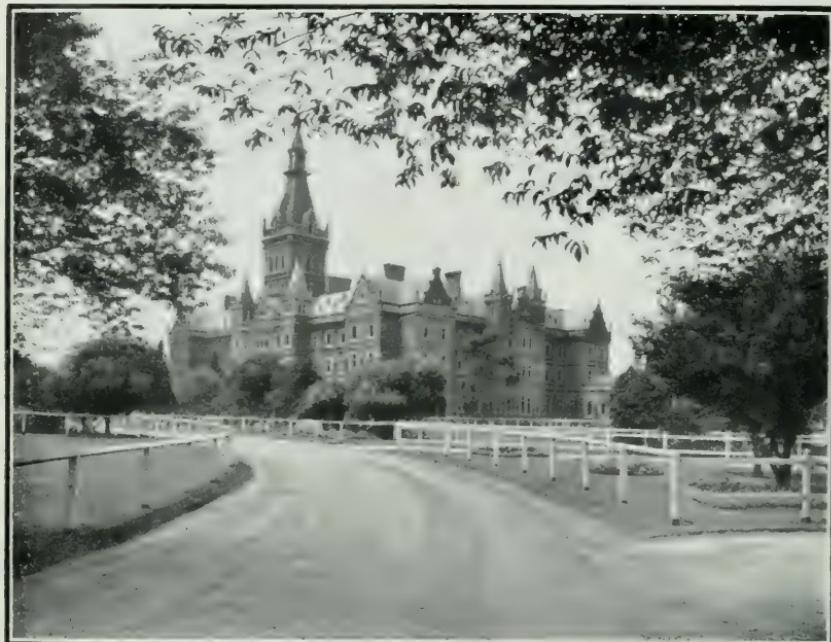
The Anglican Church was the first to erect buildings on the site assigned to it, and Trinity College, founded in 1870, was affiliated with the University in 1876, after some opposition. There were then 5 students in residence, and in addition to the Warden, 1 assistant tutor. There are now nearly 80

Trinity College. students, counting men and women, and of these 61 are in residence. The tutorial staff numbers 10, or, including the theological staff, 14. Since the opening of the college, the buildings have been greatly enlarged, and a hostel for women students was added in 1890. Trinity College has large chemical and biological laboratories, a valuable library, a chapel, dining hall, lecture rooms, common rooms, and the other accommodation necessary for residential students. The present Warden is Alexander Leeper, M.A., LL.D., appointed in 1876.

Adjoining Trinity College, and under the same governing council, is a hostel for women students of the University. This hostel was first established in 1886, and the present building was opened four years later, mainly as a result of the munificence of the late Janet Lady Clarke.

Ormond College, opened by the Presbyterian Church of Victoria in 1881, is the largest of the affiliated colleges. It is named after the late Francis Ormond, whose total benefactions to the institution amounted to about £100,000. He provided the whole expense of the building, which is very nobly designed. The buildings consist of a central group, containing lecture rooms, library, bedrooms, and studies for 90 students and the resident tutors, rooms devoted to the social life of the college, and the servants' quarters. On one side of this central group is the Master's Lodge, and on the other is the Wyselaskie Hall, where the theological work is conducted under a separate staff of tutors. The illustration gives a good view of the main building.

The Master is J. H. MacFarland, M.A., LL.D., who has been in control since the opening of the institution 32 years ago. Men students only are admitted to residence, and the accommodation is taxed to its utmost. In 1881 there were 20 students, all resident, and 3 non-resident tutors; to-day there are 90 resident and 24 non-resident students, and 10 tutors, of whom 3 reside at the college.



ORMOND COLLEGE.

Queen's College, founded by the Methodist Church of Victoria, was opened in 1881, with 8 students and 2 tutors, the present Master, the Rev. E. H. Sugden, M.A., B.Sc., then taking control. For years a heavy load of debt crippled the college, but it has emerged from that time of stress a worthy compeer of the other colleges. With an increase in the number of

**Queen's
College.** students additions have been made from time to time, and the original plan is about half completed. The college has

well-equipped lecture-rooms and laboratories, a library containing over 8,000 volumes, reading rooms, and apartments for the Master, the resident tutors, and 70 students. At present there are 67 resident and 21 non-resident students at Queen's, and the staff consists of the Master and 12 tutors, including the theological staff. Men students only are admitted to residence. The endowments for scholarships amount to about £22,000.

The Roman Catholic Church has taken some preliminary steps towards the erection of a University College on the area of ground originally granted for the purpose, and a fourth affiliated residential college—the Newman College—will probably be an accomplished fact before very long. The delay in its erection is due to the fact that, during the last 50 years, the energies

of that church in the educational field have been directed towards establishing and maintaining a large number of primary and secondary schools and the training institutions necessary to provide a supply of teachers in these schools.

In 1906 the Australian College of Dentistry was formally affiliated with the University, but this affiliation is of a nature entirely different from that granted to the residential colleges. In this case the University has certain rights of supervision and control, and, in return, recognises the professional teaching of the college in connexion with the degree of Bachelor of Dental Surgery.

In conclusion, it may be pointed out that the University of Melbourne, which has made such rapid growth in recent years, is still far from maturity, and that there is every reason to expect further developments in the near future. In education, as in other things, changes come fast in a young community.



VICTORIAN LIBRARIES, MUSEUMS, AND ART GALLERIES.

Prepared under the Supervision of Professor Baldwin Spencer.

The Public Library of Victoria is the oldest and largest public library in Australia. It was founded in 1853 and opened to the public on the 11th February, 1856. Mr. Justice Barry, one of the Puisne Judges of the colony of Victoria, was the first President of the Trustees, his colleagues on the Board of Trustees being the Hon. William Foster Stawell (afterwards Sir William Stawell, Chief Justice), the Hon. James Frederick Palmer (afterwards President of the Legislative Council), Hugh Culling Eardley Childers (who, after holding high official positions in Victoria, returned to England and entered the House of Commons), and David Charteris McArthur, superintendent of the Bank of Australasia. The first librarian was Augustus Henry Tulk, and under him the Public Library was opened in a hall in the centre of the present Swanston-street frontage. This hall was about 50 feet square, and provided accommodation for about 8,000 volumes. The Public Library of Victoria has always been remarkable for the freedom of access extended to visitors. From its opening in 1856 to the present day admission has been free to all persons over fourteen years of age, without any kind of introduction or guaranty. The officer in charge has power to exclude drunken or offensive persons, but otherwise every adult member of the public has the right of free access to the library. Not satisfied with thus providing for readers in the town of Melbourne, the Trustees resolved in 1859 to provide 500 volumes as the nucleus of a collection for circulation amongst the country residents of the colony. This was probably the introduction of the "travelling library" system in Australia, a system which has since been adopted in other States in the Commonwealth, and in America and other countries.

The Public Library of Victoria. Within three years of the opening of the Library it had outgrown the accommodation provided, and the original building was extended by the addition of a hall on the south side 95 feet long and 50 feet wide.

The north wing, completing the Swanston-street front, was added in 1864, and was first used as a picture gallery. The portico was added in 1870, and the building thus completed had shelf room for about 80,000 volumes and satisfied public requirements until 1886, when the Barry Hall, forming the south wing of the building and capable of holding about 30,000 volumes, was opened for public use. This hall was named after Sir Redmond Barry, the first President of the Trustees, who is generally accepted as the founder of the Public Library, though probably Mr. H. C. E. Childers first suggested to Mr. Latrobe, the Governor of the colony, the idea of founding such an institution. The first President of the Trustees was a man of varied interests, but, amongst the many public movements with which he was connected, the Library held first place in his heart. He devoted very much of his time to its advancement, and was constantly and with marked success gaining the co-operation of other influential people, both within and without the colony, for its benefit. In the very early days of Victoria Sir Redmond Barry had established, in a room in his own house in Bourke-street, a sort of public library of his own providing, for the use of his fellow citizens. After

his death in 1881 a movement was initiated to commemorate his many public services, and a statue was erected to his honour by public subscription and placed in front of the Public Library.

Augustus Tulk, the first librarian of the institution, died in 1873, and was succeeded by Henry Sheffield, who held office till 1881, when Dr. Bride was appointed. Under Dr. Bride the Library was re-classified, and its organization was generally placed upon a sounder basis. The Library movement was spreading with the increase of education amongst the people, and Dr. Bride arranged to obtain the services of better educated assistants than had been hitherto provided, in order to meet the increasing demands that were being made upon the institution. A Lending Branch was opened in 1892, and the public freely availed themselves of the privilege of borrowing books for home reading. This department at present contains about 30,000 volumes, and has a roll of nearly 9,000 active borrowers.



PUBLIC LIBRARY BUILDINGS, SWANSTON-STREET FRONT.

As in most libraries, want of space was the constant trouble of every librarian of the Victorian Library. In 1905 the present librarian recommended that a new building on modern lines be erected to meet the needs of the Library for many years to come, and to mark the jubilee of its opening. The Trustees approved of the proposal and of the sketch plans for the new buildings, but the Government could not see its way to provide the necessary money till 1907, when Parliament agreed to place upon the estimates the first instalment of a sum of £75,000 for the purpose.

Plans were drawn up by the architects, and the present building was completed and opened to the public by the Governor-General, Lord Denman, on the 14th November, 1913.

The new Library building was designed for the purposes of reading rooms and store rooms, the intention being that ultimately administration offices and special accommodation would be provided on the Latrobe-street frontage. The building is octagonal in form, with double walls, 15 feet apart, the dome springing from the inner wall at a height of 96 feet. It contains a basement,



VIEW OF INTERIOR, PUBLIC LIBRARY.

ground floor, first floor, and three galleries. The basement is a huge room nearly 160 feet in diameter, and is so well lighted that when empty it is an easy matter to read the smallest print in the centre of the room, some 80 feet from the windows. The ground floor is a chamber similar in size to the

basement, brilliantly lighted by means of four large windows, 30 feet x 15 feet, and eight smaller ones, about 15 feet x 4 feet. It is divided by a handsome screen in panelled cedar, 12 feet high, one-half of the room being devoted to storage of newspapers, the other portion, in front of the screen, being set apart for the accommodation of readers. Tables are so arranged that they radiate towards a counter in the middle of the screen, and from this central



JEANNE D'ARC (*Replica*), BY E. FRÉMIET.
(On the Terrace, Public Library Buildings.)

point papers are issued, and the attendant behind the counter can supervise every reader in the room. Behind the screen large cases, also arranged on a radiating plan so as to get the best results from the lighting, contain numbers

of bound volumes of newspapers. Along the back of the cedar screen are large pigeon holes containing the most recent files of unbound newspapers, and in these are placed the daily papers as they are received from the post, after being examined and stamped.



ST. GEORGE AND THE DRAGON, BY SIR J. E. BOEHM, R.A.
(On the Terrace, Public Library Buildings.)

From the ground floor a marble staircase, branching from each side of the entrance vestibule, leads to the Great Reading Room. This staircase and all the lining of the vestibule are of Victorian marble, obtained from Buchan, in Gippsland. The white treads and the balusters only are of

imported stone. The Buchan marble is of two colours, one very dark, relieved by some lighter coloured graining, and the other a brown, or "dove" colour, as it is called. The marble takes a very fine polish, and the contrast of the three colours produces a very beautiful quiet effect.

The Great Reading Room is an imposing chamber 115 feet in diameter and only one foot less in height from the floor to the centre of the dome. It is surrounded by an annulus 15 feet wide between the double walls of the building, and in this annulus are three galleries containing stack rooms for books. On four sides of the octagon, beyond the outer wall of the annulus, there is provision for four additional stack rooms several storeys in height, but at present only two of these are built, the lower storeys of these two containing staircases leading to the reading room, whilst the upper storeys are devoted to book stack purposes. The other four sides of the outer wall of the annulus are pierced by a series of long narrow windows for the purpose of lighting the book stacks. In two of the galleries provision is made for the erection of a light dividing floor so that each gallery will contain two rows of stacks, each about 7 ft. 6 in. high. The four sides of the annulus, which have no windows, are lighted from the dome of the building, the inner wall containing a series of large arches through which an excellent light is admitted from the reading room dome. In the reading room itself, the sides of the octagon present alternately a solid wall relieved by narrow balconies, containing book cases at the back, and a wall broken into a series of arches or arcades, behind which are tiers of books, the best possible decoration for a library.

Members of the public are not admitted to the galleries and store rooms, but they have free access to some 30,000 books on the main floor of the reading room. These works are for the most part standard books of reference, which may be withdrawn and replaced from time to time by the latest authorities on any particular subject. Ladders are used in the public reading room, as by their use it was found possible to place a much larger number of volumes within the direct reach of readers. The furniture of the reading room is made of Queensland silky oak. It consists of eight long tables capable of seating thirteen people on each side, with a number of smaller tables between the long tables. All tables radiate towards the centre of the room, and each reader is under supervision by an officer stationed at this point. A screen 2 feet high divides each long table so that no visitor is disturbed by having to sit face to face with another reader. The desk space devoted to each reader is 3 feet x 2 feet, with an adjustable centre piece, covered in leather, which can be raised to any angle to suit the reader's comfort, or laid flat should he wish to write, or prefer to read with his book on a flat surface. In the centre of the reading room is a handsome desk, surrounded by show cases for manuscripts or rarities. Here sit one or two supervising officers whose duty is mainly to watch the readers and generally supervise the room.

A separate inquiry room is provided near the entrance, in which are all necessary catalogues and guides for showing the resources of the Library. A lift and staircase lead from this room directly to the store rooms, and an attendant should be able to get a book from the furthest portion of the building and hand it to a reader within five minutes,

at longest, from the time at which he is asked for it. It is estimated, that, if the basement be used for book stores in addition to the ordinary stacks, the building will provide accommodation for more than 2,000,000 volumes, and provision for indefinite expansion can be made by using the buildings surrounding the octagon for library purposes. All these buildings are within 50 feet of the main reading room, and could be made into special reading rooms and stacks capable of providing for a Library larger than can be at present imagined as necessary.

There is a card catalogue of the Library compiled on the dictionary principle, *i.e.*, an author and subject catalogue combined. The subject entries are made under specific subjects instead of under classes. The catalogue is contained in 230 drawers 17 inches long and 14½ inches wide, each drawer containing a double row of cards. The weight of the cards in each drawer is considerable, and, when the drawer is in use, is distributed by a simple mechanical contrivance by means of which the drawer below the one in use (or in the case of the bottom drawer a supporting flap) is used as a support for the drawer above it. Five tiers of drawers can thus be used comfortably by a reader of average height. The size of the cataloguing cards in use is 6½ inches by 3 inches. More recent work, such as the card shelf list, is done on standard sized cards, 5 inches x 3 inches, and it is intended, when time permits, to transfer the catalogue to cards of this size so as to come into line with other libraries and card indexes.

The Library issued in 1905 a printed catalogue of its current periodicals, also on the dictionary plan, and it has a special catalogue of "Australiana," a department in which it has one of the best collections known, and which is only surpassed in Australia by the Mitchell Library in Sydney.

The newspaper collection contains fairly complete files of all newspapers published in Victoria, and a good collection of the representative papers of other States and of Great Britain, in addition to a few continental and American papers. The total number of volumes in the Institution is about 300,000.

The principal libraries in Victoria, besides the State Public Library, are the Library of Parliament, the University Library, the Supreme Court

Other Libraries. Library, the suburban libraries at Prahran, Fitzroy, Collingwood, North Melbourne, South Melbourne, Hawthorn, and Northcote, and the public libraries at Geelong, Ballarat, and Bendigo.

The Library of Parliament, initiated by the Legislative Council in 1851 and founded under its present title in 1856, exists for the use of members of both Houses. Under Messrs. Ridgway and James Smith, its earliest librarians, was obtained the nucleus of a very fine collection of classics and standard works on all subjects, in addition to the works purchased for members in connexion with their actual parliamentary duties. The standard then set has been adhered to, and the library contains to-day about 75,000 volumes.

The University Library, also established in 1856, mainly for the use of students, though members of the public are allowed to consult books, is to-day divided amongst the several schools. Most of the books, however, are still housed in the main Library building, which is far too small, and



PUBLIC LIBRARY.—UNDER THE DOME.

by no means suitable for its purpose. The collection of books is an excellent one, and includes a large number of scientific periodicals. The total number of volumes is about 34,000.

The suburban libraries of Melbourne are not comparable with libraries in America and elsewhere, which are supported by special local taxation. The best is probably the Prahran Public Library, which was established in 1861, and contains about 16,000 volumes.

The Public Library at Geelong was established in 1876 in a building which was originally erected for the Chamber of Commerce at a cost of £10,000. It contains about 6,000 volumes, and a special collection of books for the use of the blind.

The Free Library at Bendigo is now under the control of the School of Mines. It was founded as far back as 1854, and opened by Sir Charles Hotham as a Mechanics' Institute in a building erected for a mineral exhibition. In 1864 the foundation stone of a new building was laid, and in this building the present Free Library is housed. Its control was handed over by the Mechanics' Institute Committee to the Council of the Bendigo School of Mines in 1905. It contains about 12,000 volumes, free to all readers, though only subscribers are allowed to take books away from the building.

The Public Library at Ballarat was established in 1862, and to-day contains about 12,000 volumes.

Many of the country towns in Victoria have libraries connected with local Mechanics' Institutes, but for the most part they are subscription libraries, and consist very largely of collections of fiction. In many of these institutes there are free reading rooms. There is no local taxation for library purposes, and the institutes depend on local subscriptions and such grants as they can obtain from the State Government.

Among the libraries of a special character we may note that of the Royal Society of Victoria, which has about 10,000 volumes, chiefly publications of kindred institutions.

The National Herbarium contains about 8,000 volumes, comprising many valuable old botanical works gathered by the late Baron Sir Ferdinand von Mueller, long the Government Botanist of Victoria. There are efficient libraries at the Observatory, and at the Law Courts (17,600 volumes), while the rapidly increasing libraries belonging to the Commonwealth Patents Office and the Weather Bureau are at present stored in Melbourne. Several technical societies and Government Departments have libraries containing a few journals not taken elsewhere.

A Catalogue of Natural Science and Technical Periodicals in Melbourne libraries has been prepared by Dr. T. S. Hall. It is on the dictionary plan, and gives particulars of over 3,500 separate serials.

When the Public Library of Victoria was founded in the year 1853, the establishment of an Art Museum and Picture Gallery was also contemplated.

The National Gallery. The Trustees, however, were not able to extend their operations until the year 1859, when the Parliament of Victoria voted the sum of £2,000 for the purchase of works of art. With this money a collection of plaster casts, friezes, and busts was purchased in Europe. They reached Melbourne in the following year, and were shown in the entrance hall, and in the adjoining room on the north. In

1863, "a Royal Commission was appointed to inquire into the question of the promotion of the fine arts in Victoria, to submit a scheme for the formation of a Public Museum, Gallery, and Schools of Art, and to determine the best mode of expending One thousand pounds in the commencement of a Public Gallery of Art." An additional sum of £1,766 was subsequently voted for the purchase of more pictures. After setting aside £200 for the purchase of a painting by an artist resident in Australia, the Commission requested Sir Charles Eastlake, then President of the Royal Academy, to select the pictures for the proposed Picture Gallery. In all seventeen pictures were obtained, and they were hung in the first temporary Picture Gallery connected with this institution—the northern end of the Queen's Reading Room—which was opened on the 24th December, 1864. The final Report of the Royal Commission was issued in 1865, and recommended the erection of a suitable gallery for the exhibition of pictures, and that the Public Library,



VIEW OF INTERIOR, STAWELL GALLERY.

the Galleries and Schools of Art, and the Museum of Natural History should be united and form one institution. In 1869 an Act was passed to provide for the incorporation of the Public Library, Museums, and National Gallery of Victoria, and the management of the allied institution was intrusted to the Board of Trustees.

The first Gallery built expressly for the exhibition of pictures, and now known as the McArthur Gallery, was completed in 1873. Thirteen years later the Buvelot Gallery and the Painting School studios were added, and in 1903 the Stawell and La Trobe Galleries. It was not until 1882 that the office of Director of the National Gallery was created, when the late George F. Folingsby was appointed to the position. Ten years later the present Director, Mr. L. Bernard Hall, succeeded to the office.

There have been many valuable gifts of individual pictures and other works of art. The munificent bequest, however, of the late Alfred Felton, merchant, of Melbourne, who died in 1904, has made the National Gallery of Victoria one of the most heavily endowed Art Galleries in the world. The income received from his bequest at the present time is £8,000 a year.

The collection of oil paintings includes examples by Sir Joshua Reynolds, Morland, Turner, Corot, Watteau, Puvis de Chavannes, Pettie, Orchardson, Peter Graham, Fred. Walker, C. Lawson, Watts, and Burne-Jones. The principal artists represented by water colours are Turner, Madox Brown, J. Maris, David Cox, North, and Sir John Gilbert. The collection of drawings in black and white contains examples of Rousseau, A. Mauve, A. von Menzel, Holman Hunt, F. Sandys, D. Vierge, and C. Keene. In sculpture, A. Gilbert and Rodin are each represented by three examples, and Barye, Sir E. Boehm, and Frémiet each by two. The more prominent names represented in the collection of etchings and engravings are Rembrandt, Vandyck, Durer, Méryon, Seymour Haden, and Whistler.

The Art Museum contains representative examples of furniture of various periods, porcelain, pottery, jewellery, glassware, and other objects of *vertu*. The value of this section was greatly increased by the generous gift of Mr. John Connell, of Melbourne, who presented his large and comprehensive collection to the Trustees in 1912.

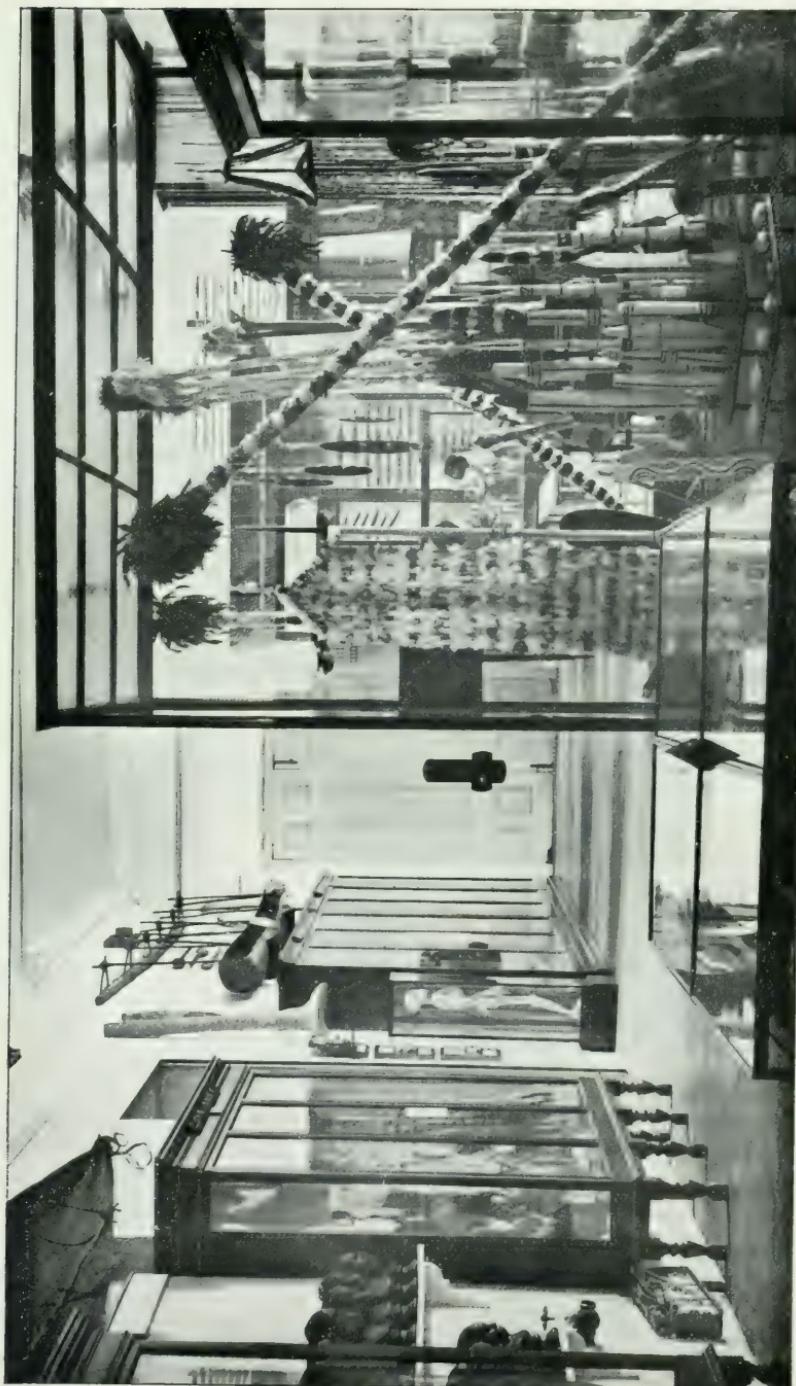
Schools of Painting and Drawing were established in 1870, the number of pupils in each being 6 and 35 respectively. Five years later the first exhibition of students' work was held. In 1886 the Travelling Scholarship was founded, the first winner being Mr. John Longstaff. This award is of the value of £150 a year, and is tenable for three years. The holder of this scholarship must study at one of the great art schools of Europe for at least two years. During the first year he must paint and present to the Trustees a study from the nude, during the second a copy of some well-known painting by an Old Master, while the contribution for the third year of study must be an original painting.

Art Galleries have been established at Ballarat, Bendigo, Geelong, Castlemaine, and Warrnambool. These are aided by loans of pictures from the National Gallery.

The germ of the present National Museum was a small collection originally housed in the Crown Lands Office in Latrobe-street. The idea of founding such a Museum originated with Captain (afterwards Sir Andrew) Clarke,

The National Museum. of the Royal Engineers, who was then Surveyor-General of Victoria. It was owing to his exertions that a start was made, and that in 1854 William Blandowski was appointed Zoologist in charge of the collections. At that time the Philosophical Society of Victoria, which later on amalgamated with the Victorian Institute, the two finally becoming the Royal Society, represented scientific thought in the Colony, and its members took great interest in the scheme.

The little Museum struggled along, but, unfortunately, the Governor, Sir Charles Hotham, was unsympathetic. He could not see any use for such an institution, and, in 1855, was anxious to do away with it and sacrifice the collections. Then there came an interesting struggle. Professor, afterwards Sir Frederick, McCoy had been appointed to the Chair of Natural



VIEW OF INTERIOR, NATIONAL MUSEUM.—AUSTRALIAN ETHNOLOGICAL COLLECTION.

Science in Melbourne University, in connexion with which he lectured on Chemistry, Zoology, Botany, Geology, and Comparative Anatomy, and was also Palæontologist in the Geological Survey Office. In 1856 he proposed that the Natural History Collections should be housed in the University. This was strongly opposed by the Philosophical Society, but was decided upon by the Legislative Council. A public meeting to protest against the removal was held and, while resolutions were being unanimously passed in favour of the collections being housed in some central part of the city, Professor McCoy was engaged in quietly and hastily removing them to the University. The Governor assured the members of the Philosophical Society that this was only a temporary expedient; but, once at the University, there they remained for 43 years.

In 1858 Professor McCoy was appointed Director, and had sole charge until 1869, when the Museum was brought under the control of the Trustees of the Public Library, National Gallery, and Museums of Victoria. In 1862 a contract was let for the erection of a Museum building in the University grounds and in this the Director gathered together a Natural History collection which increased in extent until there was barely walking room between the cases. Sir Frederick McCoy was a man of wide knowledge, with a wonderful acquisitive faculty which, fortunately for the Museum, not even the repeated protests of the Trustees could curb, and, whether funds were available or not, he seemed to be able to secure, not by any means all, but still very many of the things that he desired.

The Trustees decided that the National Museum should contain Natural History specimens only, and that those concerned with mining and technological work should be housed in the Public Library buildings. The Director protested, with the result that the transfer was only a partial one.

In 1899 Sir Frederick McCoy died, and the question arose of either adding to the building at the University or transferring the collections to the Public Library. The latter plan was decided upon, and it was determined to store a large part of the Technological specimens which were out of date, to amalgamate the valuable mineral collection with that of the National Museum, to attach to the latter the Ethnological collections, and to utilize the Technological Museum for the exhibition of the Natural History collections. In 1899 a start was made to erect a new block on the Russell-street frontage, but owing to lack of funds this was not completed till 1906.

The transfer of specimens from the University to the Public Library was accomplished in 1899.

Professor W. Baldwin Spencer was appointed Honorary Director, J. A. Kershaw Curator of the Zoological Collections, and R. H. Walcott Curator of the Geological and Mineralogical Collections. In 1902 F. Chapman was appointed Palæontologist.

Unfortunately, sufficient funds were not available to complete the buildings, the plans for which included a number of smaller exhibition rooms, together with a lecture theatre, the lack of which is much felt. The buildings comprise (1) three large exhibition halls on the first and second floors; (2) offices and store-rooms in the basement; and (3) workshops on the upper floor.

The largest of the exhibition halls measures 143 feet in length by 113 feet in width, and has a gallery 20 feet broad running all round it. The ground floor is occupied by the general zoological collection. The size of this hall renders it very difficult to arrange exhibits satisfactorily, and in order that they shall not be completely dwarfed animals of various orders have been arranged in large groups. This is only a temporary expedient until such a time as the hall can be re-organized. The gallery is occupied by the mineralogical and palaeontological collections.

The most important feature of the Museum is the Australian collection. One side of the gallery in the large hall is devoted exclusively to Australian palaeontology, and of the two halls on the Russell-street frontage, one contains the Australian zoological and the other the Australian ethnological collections. The zoological collection is fairly comprehensive, though much more space could be utilized if available. The attempt is gradually being made to show the animals in their natural surroundings, but with the very small staff and means at the disposal of the Trustees this work can only be carried out slowly. Every effort has been made during recent years to extend the Australian collections, and there is now an extensive reserve collection available for scientific work.

Special attention has been paid to Australian ethnology, and the Museum contains a unique series of sacred and ceremonial objects collected by Professor Baldwin Spencer and the late F. J. Gillen during the progress of their work in Central Australia and the Northern Territory. The Museum contains, indeed, practically the whole of the large collections made and presented to it by these two workers. It is also especially rich in stone implements of various kinds, Mr. A. S. Kenyon having presented to it the whole of his extensive collection. The stone implements now number more than 16,000 specimens illustrative of all stages and types known from Australia.

The remainder of the ethnological collection is shown in two halls, one on either side of the main entrance to the Public Library, and contains some fine examples of Papuan, Solomon Islands, New Britain, and other South Sea Island work.

The staff of the Museum is small and quite inadequate to do the work that should be done. It consists of an Honorary Director, two Curators, one in charge of the zoological and the other of the geological collections, and a palaeontologist. Besides these there are three taxidermists and an osteologist.

The specimens in the reserve collections far exceed in number those on public view, and the maintaining of them in proper condition and the performance of routine work leaves little time for research work by members of the staff. At intervals during the period of his Directorship Sir Frederick McCoy published twenty Decades dealing with the zoology and seven with the palaeontology of Victoria. The issue of these has been discontinued and their place taken by the "Records of the National Museum," which are issued periodically.

The Industrial and Technological Museum was founded in 1870 in accordance with a recommendation of the Technological Commission (1869). The building used for the purpose was the one erected for the Intercolonial Exhibition of 1866 on the site on which the new reading room now stands. Mr. J.

Cosmo Newbery, B.Sc., was appointed Superintendent in the year of the Museum's establishment, and Mr. G. H. F. Ulrich received the position of

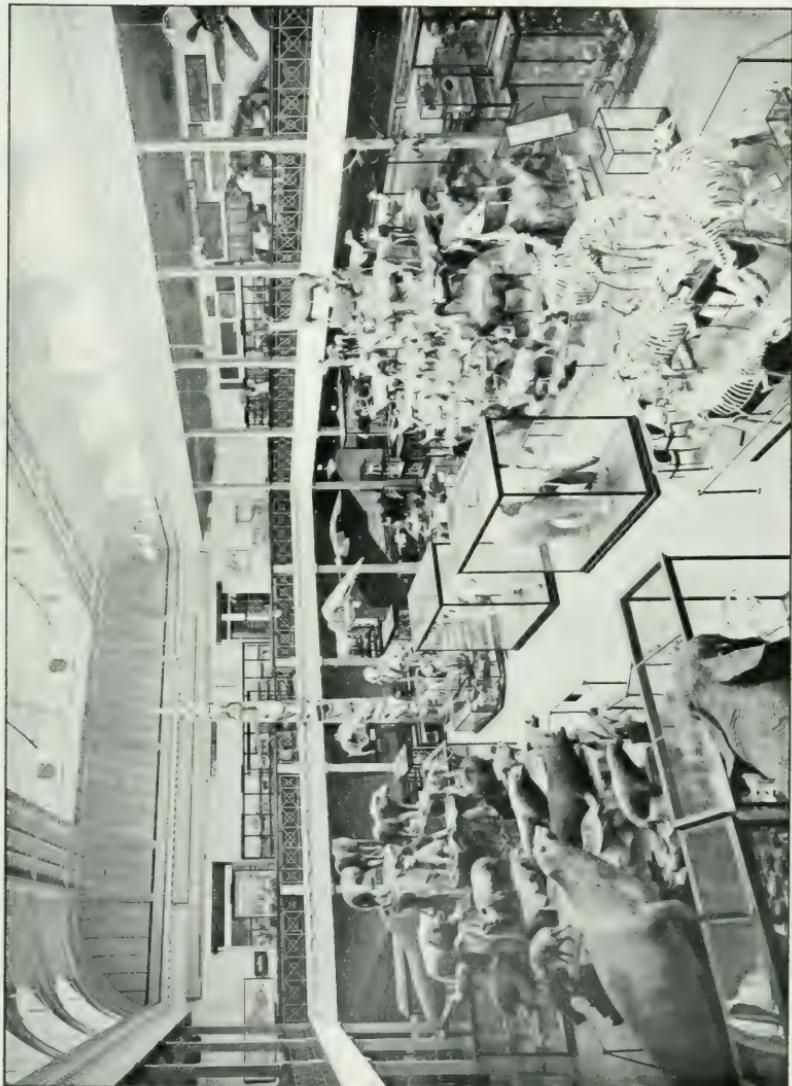
Technological Museum. Curator of the mineral collection and Instructor in Mineralogy, a position which he held until 1878. Public lectures were

instituted, besides class lectures and practical instruction in the laboratories. Most of this work was given up when the Working Men's College opened in 1887.

In 1893 the building specially constructed for the Museum, and now forming the main hall of the National Museum, was opened to the public. In the same year the Museum staff was reduced, and in 1895 it was further depleted by the death of Mr. Newbery, whose place was filled by Mr. R. H. Walcott, who had occupied the position of Mineralogist. The Museum, being without adequate staff and financial support, the collections, which had become obsolete to a great extent, were gradually abolished, and in 1899 the National Museum collections were transferred from the University grounds to the new Technological Hall. The remnant of the collections, which had been exhibited in a small room, was removed to the vaults in 1908 to make way for the new Public Library building. In 1913 the importance of re-organizing the Museum was brought before the Trustees by delegates of various institutions and bodies interested, and the Trustees decided to set apart the main reading room of the old Library building for the purpose of re-establishing the Museum on lines which will make it a valuable factor in technical education, and an aid in industrial matters generally. This work is now in hand, and as soon as the hall is available a commencement will be made with the arrangement of the collection.

The Museum of the Geological Survey contains a good collection illustrating the geological products of the State, and there are
Other Museums. Natural History Museums at Ballarat, Bendigo, and Warrnambool, but these suffer from imperfect supervision.





THE MUSEUM, MELBOURNE.—NATURAL HISTORY COLLECTION.

LOCAL GOVERNMENT IN VICTORIA.

By C. H. Meaden, Secretary, Municipal Association of Victoria.

The purpose of this paper is to indicate the main features of local government in Victoria. In doing this it would be interesting if the lines on which the municipal system now in force in this State has developed could be traced in detail, but, in the limited space available, it will be possible only to outline broadly the history of Victorian local government legislation.

The subject will be dealt with under the following headings:—

	<small>PAGE</small>		<small>PAGE</small>
<i>Origin of Local Government in England and Victoria contrasted ..</i>	154	<i>Accounts and Audit</i>	172
<i>Period prior to the separation of Victoria from New South Wales ..</i>	155	<i>Contracts</i>	173
<i>Creation of Victoria as a separate Colony</i>	156	<i>Purchasing, Leasing, or Compulsory taking of Land</i>	174
<i>Establishment of Road Districts and Shires</i>	156	<i>Construction, Maintenance, and Control of Public Highways, Bridges, Ferries, &c.</i>	174
<i>Constitution of Urban Municipalities ..</i>	159	<i>Country Roads Act 1912</i>	177
<i>Legislation now governing Municipalities—Urban and Rural ..</i>	160	<i>Sewers, Drains, and Watercourses ..</i>	179
<i>Constitution and Alteration of Constitution of Municipalities ..</i>	161	<i>Light, Heat, and Motive Power ..</i>	180
<i>Municipal Franchise</i>	163	<i>Water Supply</i>	180
<i>Election of Councillors</i>	164	<i>Prevention and Extinction of Fires ..</i>	180
<i>Municipal Councils</i>	164	<i>Markets and Weighbridges ..</i>	180
<i>Officers of the Council</i>	166	<i>Tolls</i>	181
<i>Government of Municipalities by By-laws and Regulations</i>	166	<i>Councils as Local Sanitary Authorities</i>	181
<i>Lands vested in or under the control of Municipalities</i>	167	<i>Tramways</i>	182
<i>Funds and Revenue of Municipalities ..</i>	168	<i>Workers' Dwellings</i>	182
<i>Borrowing Powers</i>	171	<i>Other Powers</i>	182
		<i>Legal proceedings</i>	183
		<i>Municipal Association of Victoria</i>	184
		<i>Scope and Operation of Local Government in Victoria</i>	184

Origin of Local Government in England and Victoria Contrasted.

In devising a scheme of local government, the experience of many countries was available for the guidance of our early legislators. What they had to do was to alter and adapt municipal systems which had gradually been evolved in older countries so that they would be suitable to the primitive conditions of a newly-settled community.

Fortunately it was possible for them to originate a system without being hampered by difficulties which would have arisen if the jealousies and opposition of existing bodies already performing some local functions, with more or less success, had had to be overcome, or if the vested rights, interests, and privileges of such bodies had had to be considered.

Comparing the origin and evolution of local government in Victoria with that in other countries, Professor Jenks in his treatise on the Government of Victoria makes the following statement:—

“In the case of a community, such as England, which has been gradually formed by the coalescence of a number of formerly separate units, it is exceedingly difficult to give any coherent account of the state of local government. Some of the local organs date back to a time far older than the central government itself. Others have been gradually dovetailed into them in the course

of centuries, till the result is a bewildering mosaic without unity or method. Such was, in fact, the case in England, until the statutes of the present (nineteenth) century made some attempt to reduce the chaos to order. Parishes, hundreds, municipalities, highway districts, petty sessional divisions, poor law unions, electoral districts, health districts, ridings, and other units of government lay huddled together in confusion, overlapping and rivalling one another.

"Happily in the case of Victoria the materials are far simpler. In the true sense of the term, there never has been any local government in Victoria. That is, there has never been any local unit evolved spontaneously and independently of the central power. Every local authority is a creation either of the Imperial or the Colonial legislature, and is a subordinate body deriving its existence from a higher source.

"This fact has, naturally, produced a palpable unity in the system. Powers of government conferred upon local bodies have from time to time been codified and arranged with a view to their working as a whole. Care has been taken to keep the hand of the central authority over all."

Period prior to the Separation of Victoria from New South Wales.

Prior to 1851 the territory which is now contained in the State of Victoria formed part of New South Wales, and was known as the District of Port Phillip. Before separation took place an endeavour was made to inaugurate municipal institutions in the Port Phillip District, as well as in those parts of the colony nearer to Sydney. This was done under the Imperial Act 5 and 6 Victoria, c. 76, which empowered the Governor of New South Wales by letters patent to incorporate the inhabitants of every county within the colony, or of such parts of counties or other divisions as to him should seem fit : to form districts for the purpose of the Act and to establish a council in every such district for the local government thereof. The attempts to provide local government by these means met with failure, however, for reasons which will be mentioned later.

A different, and wholly satisfactory, result followed the Act passed by the New South Wales Parliament in 1842 (6 Vict., No. 7), the preamble to which recited that "for the better protection, care, and management of the local interests of the Town of Melbourne and for the improvement thereof it is expedient that the inhabitants of the said town be incorporated." In the drafting of this Act, the *Municipal Corporations Act* 1835 (England) (5 and 6 William 4, c. 76) evidently was taken as a model, for its provisions were largely copied. Seven years later (1849) the Act 13 Vict., No. 40, was passed to incorporate the inhabitants of the Town of Geelong, and to extend and apply thereto the laws in force for the regulation of the Corporation of Melbourne.

In 1840, the Legislative Council of New South Wales had passed an Act (4 Vict., No. 12) which provided for the election of trustees of parish roads by owners of land situated within three miles of and usually approached by a parish road. Trustees held office for three years, and they had power to appoint surveyors and other officers, and to levy rates for the purpose of making or maintaining parish roads. The Governor could proclaim tolls, the proceeds of which were available for expenditure on their improvement.

Trustees of parish roads were elected in some parts of Victoria, and the *Roads Act* 1853, which will be referred to again, enacted that such trustees were to act as district boards until district boards under the Roads Act had been formed.

Creation of Victoria as a Separate Colony.

Victoria was created a separate colony, from 1st July, 1851, by the Imperial Act 13 and 14 Vict., c. 59 (1850). This Act contained a provision that, where by letters patent a district had been formed under the Act 5 and 6 Vict., c. 76, and there had not been an election of councillors, the letters patent should be void. It further provided, that where there had been an election of councillors for a district, the Governor might revoke the letters patent forming such district upon the petition of the council; or, if the council had ceased to exist, upon the petition of the inhabitant householders of the district.

Authority was given for the formation of new districts upon the petition of inhabitant householders, and for the establishment of a council for the district. At least one month's notice of such petition and of the time when the Governor intended to take the same into consideration had to be published, by proclamation, before letters patent could be issued. The provisions of Act 5 and 6 Vict., c. 76, were extended to districts so voluntarily constituted, but an unpopular provision of the 1842 Act, which required that one-half of the expense of the police force should be defrayed by assessment upon the several districts, was repealed.

The Governor and the Legislative Council, by any Act or Acts, might make regulations and provisions for or concerning the raising, assessing, and levying of tolls, rates, and assessments within or on or in respect of any public works or any property within any district, or for the appropriation of such tolls, rates, and assessments. Such alterations and provisions in and concerning the constitution, duties, and powers of district councils, and such alterations in the number and boundaries of districts, and such provisions for establishing district councils in new or altered districts, as to the Governor and Legislative Council might seem meet, could be made in the same way.

Establishment of Road Districts and Shires.

A Select Committee was appointed by the Legislative Council of Victoria on 14th July, 1852, to inquire into the working of the District Councils that had been established, and the causes of their meetings and practical workings having been discontinued, and to take evidence and to report upon the expediency of their being revived with such alterations in their constitutions, duties, or powers as to the committee might seem advisable. The committee reported that the discontinuance of operations was attributable to the arbitrary and unconstitutional nature of some of the provisions of the Act; to expensive details which were rendered unavoidable in giving it practical effect; to the multifarious and too comprehensive duties imposed upon councils; and to the inadequate provision of funds for the purposes of the councils.

The committee expressed the opinion that with certain alterations the re-establishment of the system would be attended with very great benefit

to the colony. It was suggested, amongst other things, that the area of districts should be reduced, and that the provision regarding education should be omitted as being a subject which in the circumstances of the colony should not fall within the sphere of the duties of a district council. The committee pointed out also that, through the repeal by the Constitution Act of the provisions of the 1842 Act relating to police expenses, a great objection to the system had been removed. The committee proposed that a Bill should be introduced to give effect to the suggestions contained in its report: but this was not done, as much greater importance appears to have been attached by the Legislative Council to the report of another Select Committee appointed in the previous session and re-appointed at the same sitting of the House as that at which the District Councils Committee was appointed. The function of this other Committee was to inquire into and report on the condition of existing roads and bridges, and how the funds placed at the disposal of the Government might be expended to the best advantage in making and repairing roads and bridges throughout the colony. The report of the committee contained the following graphic account of the then condition of Victorian roads:—

“ By means of loans secured on their revenue, and by the assessment of the citizens, with little aid from other sources, the corporation of the City of Melbourne have formed and metalled most of the streets of the metropolis; while the roads of the colony, under the charge of the Government, have generally been allowed to remain unimproved and neglected, to such an extent as to present in winter the wretched aspect of a succession of quagmires, impassable for wheel carriages, and traversed by packhorses, conveying goods and merchandise at an enormous cost of transit, rendering all travelling difficult and dangerous, the conveyance of the post irregular and a heavy charge on the revenue, and the pursuit and apprehension of criminals in the interior a matter of so much difficulty for the police to accomplish as to act as a premium for the commission of crime, and a protection to the criminal. But the worst feature in the present state of our thoroughfares is the want of a sufficient number of bridges, where roads are required, as in the interior chiefly, for the annual transport of wool to the market, or the driving of cattle. For the want of such bridges in the interior, lines of communication cannot be maintained during the rainy season; and, in addition to the inconvenience suffered by the public from this cause, many human lives are annually lost in endeavouring to ford the rivers.”

The committee suggested that main roads should be made by means of grants from the public revenues, and that toll gates should be erected and the revenue expended in keeping the roads in repair. The committee recommended the repeal of existing Acts and the passing of a Road Act on the lines of Acts in force in Tasmania and South Australia: That a Central Road Board of five members (two to be nominated by the Lieutenant-Governor and three to be elected by the Legislative Council from their own members), should be appointed to align, make, maintain, and improve any new or existing main road, and any bridge on such road, and also all parish roads and cross roads until district road boards were appointed: That the Lieutenant-Governor should be empowered to declare, by proclamation, any portion of the colony to be a road district, and that at any time after such

proclamation it should be lawful for not less than five householders and five landholders to require a police magistrate or justice of the peace to convene a public meeting to elect not less than five nor more than nine members to form a district road board, each member to hold office for one year, and to be eligible for re-election: That each district road board should be empowered to make, maintain, or improve district and cross roads and the bridges thereon, subject only to the general plan of the Central Road Board: That at the first public meeting, and at every subsequent annual meeting, the landholders and householders present should be empowered to make an assessment of the amount to be charged on all lands in the district, whether such lands belonged to the Crown or not; the amount of such assessment not to exceed in any year one penny per acre on all grass lands, twopence per acre on cultivated lands, and sixpence in the pound on the rental of any messuage, tenement, or dwelling house: That the chairman of each local road board should have a seat at the Central Road Board and be entitled to speak, but not to vote. The committee, in conclusion, urged the necessity of granting a sufficient vote in aid of the system recommended, in view of the fact that it was in evidence that the construction of a single mile of road would cost £3,000. The committee suggested a vote of £150,000 from general revenue and £150,000 from territorial revenue, making a total of £300,000 for expenditure on roads and bridges for the year 1853.

The proposals contained in this report were the basis of the *Roads Act* 1853 (16 Vict., No. 40). The suggestion regarding the constitution of the Central Road Board was not accepted, but a board was created consisting of three members appointed, during pleasure, by the Lieutenant-Governor. The limits of rates to be levied by a district board were fixed by the Act in accordance with the recommendation of the committee, excepting that for cultivated land sixpence was substituted for twopence per acre. Payment of rates could be enforced, without warrant, by distress and sale of goods and chattels found upon any part of a property. The primary liability for the rate was imposed upon the occupier, but he was empowered to deduct one-half from his rent. All funds collected by district boards had to be paid into the Colonial Treasury, and moneys were drawn by warrants signed by at least two members of the board, of whom one had to be the chairman. It was unlawful for the board to enter into a contract involving a payment in excess of the funds actually at the time at its disposal, or to borrow moneys or to anticipate funds in any manner whatever.

This Act was repealed, and its place taken by the *Road Districts and Shires Act* 1863 (27 Vict., No. 176), which provided for the continuance of existing road districts and the constitution of new ones, but also made provision for the constitution of shires. It created the inhabitants of each road district a body corporate under the name of the District Board and Ratepayers. All roads, bridges, and ferries within each district were placed under the control of the board; and upon it was imposed the duty of constructing and maintaining such portions of main roads as were within the district. The Central Road Board was abolished, and the constitution of district boards and the qualifications of members and voters were altered. Many of the provisions which have been continued in later Acts were also included. It was enacted that any "District" having an area of not less than

100 square miles and a revenue, from its last general rate, of not less than £1,000, might be proclaimed a shire. The inhabitants of a shire were constituted a body corporate with the title of the Councillors and Ratepayers of such shire. A shire had conferred on it, in addition to the powers possessed by road boards, the right of raising loans on mortgage of special rates. It was entitled to receive moneys payable under Acts relating to licensed publicans, and other concessions were granted to it.

The *Shires Statute* 1869 (33 Vict., No. 358), which amended and consolidated the law relating to road districts and shires, continued in existence 52 road districts and 54 shires which had been created prior to the passing of that Act, and empowered the Governor, upon the petition of at least 50 inhabitants, to constitute new shires. An amending Act passed in the following year—the *Shires Statute Amendment Act* 1870—empowered the Governor, without petition, to constitute as a shire any road district the annual value of the rateable property in which amounted to or exceeded £12,000. The number of road districts then gradually lessened, and the few that existed at the time of the passing of the *Local Government Act* 1874 were constituted shires.

Constitution of Urban Municipalities.

All the legislation to which reference has previously been made (with the exception of the Acts dealing with Melbourne and Geelong) related to local government in rural districts. The discovery of gold in 1851 caused a large influx of population, which resulted in the rapid growth of a number of settlements forming the suburbs of Melbourne, and in the sudden springing into existence of towns of considerable importance in the gold-fields which had been opened up in several parts of the State.

This led to the passing of the *Municipal Institutions Act* 1854 (18 Vict., No. 15) under which any district which had an area not exceeding 9 square miles, with no point within such area distant more than 6 miles from any other point, and a population of not less than 300 householders, might on petition be constituted a "municipal district." The district was governed by a council; and the "council" was a body corporate. A public meeting of resident landholders and householders decided the number of councillors, and their remuneration, if any; and elected the first council. Thereafter, annual elections were held, at which persons on the ratepayers' roll were entitled to vote. The council had power to appoint officers; to make by-laws for the general good government of the district; to control and manage roads, piers, and wharves; to provide a water supply; to establish public cemeteries; to aid the poor and infirm; to establish tolls; to levy rates; to borrow money for public works; and to perform certain other functions.

Before by-laws and rates and assessments came into force they had to be approved by the Lieutenant-Governor, and the right was given to the Government of inspecting the progress of works constructed out of loan moneys. Nine years later this Act was replaced by the *Municipal Institutions Consolidation and Amendment Act* 1863 (27 Vict., No. 184). It, in time, was repealed by the *Boroughs Statute* 1869 (33 Vict., No. 359), which re-enacted, in altered form, its principal provisions.

Melbourne and Geelong, originally constituted as towns, have since been declared cities—the former in 1847 and the latter in 1910. Both of them retain the constitutions which they derived from the Acts of the New South Wales Parliament, although the laws by which they are now regulated have been considerably altered and extended by Acts of the Victorian legislature relating expressly to those municipalities, or by the application to them of certain of the provisions of Acts under which the other municipalities of the State are governed. There are, however, still some points of difference between the law relating to municipalities generally and those affecting Melbourne and Geelong only. In both of these cities the governing body consists not only of councillors elected by the ratepayers, but also of aldermen elected by the council. Owners and occupiers of property (who for six months have resided within seven miles of the municipal boundary) are enrolled as voters, if they are rated at £10 per annum or over and have paid their rates. Rating at under £100 entitles a person to one vote; at £100, or over, but less than £150, to two votes; and at £150 or over, to three votes. In other municipalities also plurality of votes, up to three, is allowed, but on a different basis. A person to be qualified to hold the office of alderman or councillor in Melbourne or Geelong must be rated and enrolled in respect of property of an annual value of £50 or be possessed of real or personal estate, or both, to the amount of £1,000, either in his own right or in that of his wife. Provisions relating to auditors, assessors, elections, valuations, rating, and borrowing are amongst the other matters in which differences exist. The title of The Right Honorable the Lord Mayor of the City of Melbourne was authorized by His Majesty the King by letters patent in 1902.

Legislation now Governing Municipalities—Urban and Rural.

Parliament, when enacting the *Shires Statute* 1869 (33 Vict., No. 358) and the *Boroughs Statute* 1869 (33 Vict., No. 359), retained in separate statutes the laws regulating municipal affairs in rural and urban localities respectively. A different policy was adopted when the two statutes of 1869 were repealed by the *Local Government Act* 1874 (38 Vict., No. 506). In this comprehensive statute there were grouped together the numerous provisions relating to both town and country municipalities. Municipal law was so codified that in a much more compact form, but one in which the particular provisions relating to each of the two classes of municipalities were easily separable, there might be found all the provisions by which the whole of the municipalities constituted under Acts of the Victorian legislature were regulated and controlled.

Since 1874 the principal Acts relating to local government which have been passed are the *Local Government Act* 1890 (No. 1112) (which merely consolidated the Act of 1874 with the amending Acts passed between that date and 1890) and the *Local Government Act* 1903 (No. 1893). The last-mentioned Act not only consolidated the 1890 Act and several subsequent amending Acts (the most important of which was the *Local Government Act* 1891 (No. 1243)), but it embodied a number of amending provisions which were recommended by a Royal Commission that had been appointed to consider and report on the subject of local government laws.

Apart from the *Country Roads Act* 1912, the legislature has made comparatively little change in municipal laws since the passing of the *Local Government Act* 1903, and, excepting where it is otherwise stated, the various provisions to which reference is made in this paper are contained in that Act.

Constitution and Alteration of Constitution of Municipalities.

The whole of the mainland of Victoria is now subject to local government, the only territory not within a municipal district being French Island, in Western Port Bay. This area will probably soon be added to one of the adjacent municipal districts.

The fact that the inhabitants of all parts of Victoria voluntarily adopted the form of local government made available to them shows that the system has met with popular favour, and that its advantages have been fully recognized.

At the present date there are in Victoria :—

Cities	18
Towns	7
Boroughs	36
Shires	147
	—
Total	208
	—

The Governor in Council is empowered to constitute new municipalities or to unite existing ones, to alter the boundaries of municipal districts, and in other ways to change the constitution of municipalities, but such powers may be exercised only upon petition.

For the constitution of a shire, the petition must be signed by at least 50 inhabitants possessing rateable property therein, including a majority of the persons on a municipal roll in respect of property in any portion of a municipal district proposed to be included in the shire. There is now no restriction as to the minimum or maximum area of a shire, but it must contain rateable property capable of yielding a sum of £1,500 upon a rate not exceeding One shilling in the pound on the annual value thereof.

For the constitution of a borough, the petition must contain the signatures of at least 250 resident householders, including a majority of the persons on a municipal roll in respect of property in any portion of a municipal district proposed to be included in the borough. The area of a borough must not exceed 9 square miles, or have any point in such area distant more than 6 miles from any other point therein. It must contain a population of not less than 500 inhabitant householders, and have rateable property capable of yielding upon a rate not exceeding One shilling in the pound on the annual value thereof a sum of £300. An area which comprises portions of different cities, towns, or boroughs may not be constituted a new city, town, or borough.

A borough may be declared a town, if it has an annual revenue of not less than £10,000, or a city, if it has an annual revenue of not less than £20,000.

On a petition under the corporate seals of the municipalities affected, two or more cities, towns, or boroughs which form one continuous area may be united, notwithstanding that their area when united will exceed the area

prescribed for a newly constituted borough. Any number of municipalities, one of which is a shire, the districts whereof form one continuous area, may be united so as to form one shire.

If petitions in accordance with the Act are presented, municipal districts may be subdivided, or re-subdivided, into any number of subdivisions not exceeding eight. In shires such subdivisions are called ridings; and in cities, towns and boroughs, wards. Provision is also made for abolishing subdivisions or altering the boundaries thereof; for determining or altering within the limits prescribed by the Act the number of councillors; and for altering the name of any municipal district and of the corporation thereof.

The Governor in Council may, without petition, make orders exercising any of such powers in respect of a municipality or portion thereof, if in such municipality there is no council, or not sufficient councillors to form a quorum of the council, or for altering for the purpose of adjustment the boundaries of coterminous municipal districts or subdivisions.

Property, income, assets, rights, liabilities, expenses, and other matters are apportioned, settled, adjusted, or determined by the councils of the municipalities affected when in consequence of the exercise of any of the foregoing powers a portion of a municipal district is severed. The Governor in Council may make the necessary apportionment, settlement, adjustment, or determination, if the councils fail to do so.

Some years ago a shire could be constituted if it contained rateable property capable of yielding a revenue of £500 at least on a rate of One shilling in the pound. The minimum, as already stated, is now £1,500. This alteration was made in 1896 as a check upon the creation of a large number of very small municipalities. As a further restriction it was enacted in 1903 that no order should be made which would have the effect of reducing the revenue of an existing shire to less than the minimum required for a new shire. At the same time the severance of any borough so as to bring its population and revenue below that required for a new borough was prohibited.

Notwithstanding these provisions there are municipalities whose revenues are too small, and amalgamation of some, and absorption of others by the recasting of boundaries, must be effected if the most economical and satisfactory administration is to be secured. With this object in view certain provisions have been submitted for the consideration of Parliament, but, at present, they have come before one branch only of the legislature. It is proposed that where a borough or shire does not contain rateable property capable of yielding on a rate of One shilling in the pound £300 and £1,500 respectively, the Governor in Council may, without petition, unite such borough or shire with an adjoining municipality, or sever any portion or portions thereof and annex the same to any other municipal district or districts. No such order is to be made, however, unless the Country Roads Board recommends that it is expedient to do so, and at least three months' notice is given, so that the council of the municipality or any creditor may have full opportunity to show cause why the order should not be made, nor until the Minister has entertained, inquired into, and decided upon any representation made by or on behalf of the council or any creditor.

Municipal Franchise.

Every person (male or female), who on the 10th day of June is of the full age of 21 years and is liable to be rated in respect of property on which all rates made more than three months previously have been paid, is entitled to be enrolled as a municipal voter.

When a property is occupied, the occupier is the person who is liable to be rated and who is given the right of voting. In the case of vacant lands or premises the owner is liable to be rated and entitled to be enrolled. In no case can both occupier and owner be enrolled. A resident occupier of property is enrolled irrespective of its value, but an owner of property of an annual value of less than £5 is not entitled to enrolment. Neither are Chinese, unless they are naturalized or are natural-born subjects of His Majesty.

Plurality of votes is allowed on the following scale :—

Annual Rateable Value of Property.		
Number of Votes.	Cities, Towns, and Boroughs.	Shires.
1	Under £50	Under £25
2	From £50 to £100	£25 to £75
3	£100 and upwards	£75 and upwards

When more persons than one are jointly liable to be rated in respect of a property, not more than three of them are enrolled. For determining the number of votes to which they are entitled they are each deemed to be liable to be rated in respect of property of equal rateable value to that of the whole value of the property divided by the number of persons so enrolled. When there are more than three persons rated jointly, the names standing first in order on the rate are taken.

A corporation which is liable to be rated may in any year, by writing, under its common seal, appoint any number of persons not exceeding three to be enrolled in its place. Each of such persons is deemed to be rated in respect of property of equal rateable value to that for which the corporation is liable to be rated, divided by the number of persons so nominated.

In a subdivided municipal district a person is enrolled for every subdivision in which he has rateable property, and in respect of each subdivision is given the number of votes to which he is entitled upon the value of the property therein for which he is liable to be rated and in respect of which the rates have been paid as provided by the Act.

Very complete machinery is provided for the preparation, inspection, and revision of the voters' lists. Claims may be made by persons who are entitled to have their names on the lists, or objections may be lodged by ratepayers in respect of any names which they are of opinion are wrongfully on the lists. The Revision Court consists of the chairman of the municipality, or, in his absence, of a chairman appointed by the other members of the Court, and of not fewer than three other members of the council.

Election of Councillors.

The first election of councillors in a newly-constituted municipality is held on such day not less than 40 days after the constitution of the municipality as the Governor in Council may appoint. At this election the whole number of councillors are returned, of whom one-third hold office for one year, one-third for two years, and one-third for three years. Afterwards an election is held annually on the fourth Thursday in August. The seats of the one-third of the councillors which then become vacant are filled by the return of councillors who hold office for three years.

An election to fill an extraordinary vacancy is held on such day not less than twenty nor more than twenty-five days after the occurrence thereof, as the chairman of the municipality may appoint, or in default of such appointment on the thirtieth day after the date on which the vacancy occurred.

On the petition of the council of a municipality the Governor in Council may make an order bringing into force at elections of councillors provisions relating to voting by post.

Municipal Councils.

The council is the executive of the municipality, and all acts of the council are deemed to be the acts of the municipality. The number of councillors in an unsubdivided district must be some multiple of three, not less than six nor more than twenty-four. In a subdivided district there are three councillors for each subdivision, and, as eight is the greatest number of subdivisions allowed, the maximum number of councillors in that case also is twenty-four. The powers vested in the council may be exercised at any meeting at which nine councillors, or any smaller number forming the major part of the number of councillors, are present. All questions are decided by the majority present, and by open voting. The chairman, excepting in certain specified matters, has a second or casting vote.

The Governor in Council is empowered to appoint a commissioner to exercise the powers of the council, if in any municipality there is no council or not enough councillors to form a quorum. This provision was enacted in 1891, but, fortunately, a contingency such as that which it was intended to meet has not since arisen.

A person to be qualified to hold the office of councillor must be liable to be rated in respect of property of an annual value of £20 at the least. Females, uncertificated insolvents, persons attainted of treason or convicted of felony or perjury or any infamous crime, persons of unsound mind, and persons holding any place of profit or directly or indirectly interested in any contract with the municipality, are incapable to be or continue councillors.

Before entering upon the duties of his office a councillor is required to make a solemn declaration that he will faithfully and impartially, according to the best of his skill and judgment, execute all the powers and authorities reposed in him as a councillor by virtue of the Local Government Act. If he does not make this declaration within two months of the date of his election, his seat becomes vacant. An extraordinary vacancy is also created by death, resignation, disqualification, ouster, or absence from four consecutive meetings without leave.

A person who acts as a councillor when incapacitated is liable for every such offence to a penalty not exceeding £50, and a councillor who votes upon or takes part in the discussion of any matter in which he has directly or indirectly by himself or his partners any pecuniary interest is liable to a similar penalty.

The council is presided over by a chairman, who, in cities, towns and boroughs, is called the mayor; and in shires, the president. He is appointed for a term of twelve months, and his election takes place shortly after the annual election of councillors. The mayor or president takes precedence at all municipal proceedings in the district. He is a justice of the peace for every bailiwick in which any part of the municipal district is situated, during his term of office and for twelve months thereafter, if during that time he continues to be a councillor.

Prior to the election of the chairman, the council may grant him for his own use an allowance, which is not to exceed three per cent. of the revenue of the municipality for the year, but it is not usual to grant the full amount authorized.

The council is empowered to provide suitable offices in which to transact its business, and for the holding of public meetings and the transacting of such public business relating to the municipality as the council may permit. Ordinary meetings are held at the municipal offices on such day and hour in each week, month, or other stated space of time as the council may appoint. All ordinary meetings are held with open doors, unless it becomes necessary to exclude strangers on account of their disorderly conduct. Notice has to be given to councillors of any business, other than ordinary business, intended to be transacted at any ordinary meeting. Special meetings may be called by the chairman or by any three or more councillors. Notice of a special meeting must be in writing, and be given to each councillor a specified time before the meeting. Only the business stated in the notice may be transacted at a special meeting.

Resolutions cannot be revoked or altered unless at least seven clear days' notice of intention to propose such revocation or alteration is given to each councillor, nor unless the revocation or alteration is agreed upon by a prescribed majority.

Certain things may be done by the council by "special order" only. In such cases the resolution has to be agreed to after notice thereof has been given as for extraordinary business, and the resolution must be confirmed at a meeting held not sooner than 25 clear days thereafter. Further conditions are that, in the interval, the time at which the subsequent meeting is to be held, and the substance of the resolution, shall be advertised twice at least in a newspaper, and that notice of the subsequent meeting and of the resolution shall be given to councillors.

If a "Call of the Council" is made, any councillor who, without reasonable excuse, fails to attend, or who being present leaves, without the permission of the chairman, before all the business is concluded, is guilty of an offence against the Act and is liable to a penalty.

Councils are empowered to appoint occasional or standing committees, and may from time to time continue, alter, or discontinue any such committee. All committees are required to report to the council.

Minutes of the proceedings of the council have to be entered in a book kept by the municipal clerk under the superintendence of the council, and, after confirmation, such minutes or attested copies thereof or extracts therefrom are *prima facie* evidence in all courts of law.

Officers of the Council.

Councils are empowered to appoint a municipal clerk, a treasurer, a surveyor or engineer, and such valuers, collectors, and other officers as they may deem necessary. No person is at the same time to hold the offices of treasurer and rate collector. In a city, town, or borough, the municipal clerk is entitled the town clerk, and in a shire, the shire secretary. If a municipal clerk at the time of his appointment does not possess a certificate issued by the Municipal Clerks' Board, he must become entitled to receive such certificate by passing an examination within one year. A surveyor or engineer must at the time of his appointment be the holder of a certificate issued by the Municipal Surveyors' Board.

Any officer who exacts or accepts on account of anything done by virtue of his office, or in relation to the matters to be done under the Act, any fee or reward other than the salary, or allowance by way of salary, allowed by the council, or is in anywise concerned or interested in any bargain or contract made with the council, is thereby rendered incapable of being afterwards employed by the council, and is also liable to a penalty not exceeding £100.

On the death or resignation of an officer, or on the cessation or abolition of his office, a gratuity may be paid by the council to him or to such of his surviving relations as the council may think fit.

Security has to be taken by the council for the faithful execution of their duties by officers entrusted with the custody and control of moneys.

Government of Municipalities by By-Laws and Regulations.

In addition to the duty of administering provisions contained in various public statutes, municipal councils have had delegated to them by Parliament the power to legislate locally on a large number of matters.

Most of the purposes for which by-laws may be made are set out in Section 197 of the *Local Government Act* 1903. Such purposes include, amongst other things : *Regulating*—municipal waterworks, public meetings of rate-payers, fairs, public sales and labour marts, sewerage and drainage, lighting, quarrying and blasting, traffic and processions, merry-go-rounds and shooting galleries, cabmen's shelters and public conveniences provided by the council ; *Prohibiting or Regulating*—use of barbed wire on fences adjoining roads, writing, painting, &c., advertisements, &c., on footpaths, roads, fences, or other municipal property, grazing of cattle on unenclosed lands, locking of wheels of vehicles when descending a hill, drawing or trailing of sledges or heavy materials upon footways and carriage ways ; *Prohibiting*—spitting or expectorating on footpaths, throwing orange-peel, banana-peel, or other vegetable matter upon any public highway ; *Suppressing* nuisances ; *Restraining* noisome and offensive trades. After specifically mentioning these varied matters which may be the subject of by-laws, the section concludes with a comprehensive authority for the making of by-laws for maintaining the good rule and government of the municipality.

The Thirteenth Schedule to the *Local Government Act* 1903 also contains provisions on a wide range of subjects, the whole or any of which may, by an adopting by-law, be brought into operation in a municipal district.

Section 198 of the same Act gives very extensive powers to councils to make by-laws to regulate and restrain the erection or construction, or to require the pulling down, of buildings, erections, or hoardings, but such by-laws have to receive the approval of the Governor in Council before they come into force.

In other parts of the Local Government Act, power to make by-laws relating to the following matters is given :—Adoption by shires of provisions regarding street levels (section 512); width of tires (section 576); traction engine traffic (section 594); public waterworks, dams, and reservoirs 599 (4); use of baths and washhouses (section 604); markets and weighing machines (section 635); pleasure grounds, libraries, museums, &c. (section 650); also *Municipal Grounds Act* 1905 (section 2).

The following Acts also authorize the making of by-laws or regulations by municipalities :—*Butchers and Abattoirs Act* 1890 (sections 15, 24, 25, 27, 45); *Coal and Firewood Act* 1904 (section 7); *Electric Light and Power Act* 1896 (section 15); *Explosives Act* 1890 (section 54); *Fire Brigades Act* 1890 (section 66); *Health Act* 1890 (section 35 as amended by *Health Act* 1900, section 2, sections 84, 111, 241, 244, 253); *Meat Supervision Act* 1900 (sections 28, 44); *Police Offences Act* 1912 (sections 6, 7); *Vermi Destruction Act* 1890 (section 69); *Weights and Measures Act* 1890 (sections 25, 28, 29); *Workers' Dwellings Act* 1914 (section 7).

Regulations and joint regulations may be made for any municipality or municipalities in which any provision of the Thirteenth Schedule is in force authorizing the making of such regulation or joint regulations, and for the purposes prescribed by such provisions.

By-laws and regulations must not contain matter contrary to any public law in force in Victoria, and they can only be made by "Special Order." By-laws must be published at length in the *Government Gazette*; but the publication therein of a notice of the making of a regulation setting forth its title, and that a copy thereof is open for inspection at the office of the council, is sufficient.

By-laws have the force of law throughout the municipal district, and they may impose a penalty of not more than £20 for wilful act or default contrary thereto; but a by-law may impose penalties, which for the aggregate of several acts or for one act having several effects contrary thereto, may amount to more than £20.

A by-law or regulation may be repealed, not only by the council by which it is made, but by the Governor in Council by order published in the *Government Gazette*.

Lands Vested in or under the Control of Municipalities.

Municipalities may lease, purchase, hold, and alienate land. They have acquired lands by grant from the Crown and by voluntary and compulsory purchase from private landholders. Crown lands have been reserved for various public purposes, and in many cases these are under the care and,

management of the local council. A municipality may, with the consent of the Governor in Council, sell and convey in fee or for any lesser estate, lands purchased for value, or acquired from the Crown, which are not in the opinion of the council required for the purposes of the undertaking for which they were purchased and are not otherwise subject to any trust. A council may give a lease, for a term not exceeding seven years, of any land vested in the municipality. With the consent of the Governor in Council, leases up to twenty-one years may be granted.

Funds and Revenue of Municipalities.

The ordinary revenue of a municipality consists principally of rates and charges, grants and subsidy received from the Government, licence fees, dog registration fees, pound fees, market and weighbridge dues, and rents. These and all other moneys received by the council, except loan moneys, form the municipal fund. Such fund may be applied towards the payment of all expenses necessarily incurred in carrying into execution and in doing and performing all acts and things which the council is empowered or required by the Local Government Acts or any other Act to do or perform. Details of revenue and expenditure are given in a statement at the end of this paper.

When a municipal district is subdivided, there must be expended every year in each subdivision a proportionate share of at least one-half of the amount of general rates received, after deducting therefrom all sums paid or payable on account of any loan.

All land, save that expressly exempted, is rateable by municipalities. The exemptions, however, are numerous, and include:—(a) land the property of His Majesty which is unoccupied or used for public purposes; (b) land used exclusively for commons, mines, public worship, mechanics' institutes, public libraries, cemeteries, primary schools in which education is given free to the scholars, or for charitable purposes; (c) land vested in or in the occupation of or held in trust for or under the management and control of any municipality or the council thereof, or of any authority constituted under the Water Acts; (d) land vested in fee in the Victorian Railways Commissioners, the Minister of Public Instruction, the Board of Land and Works, the Melbourne Harbor Trust, and the Melbourne and Metropolitan Board of Works. But it is provided that the lands mentioned in paragraphs (c) and (d) are rateable if occupied for any private purpose other than mining or as railway refreshment rooms.

For the purpose of rating, the valuation of property is computed at its net annual value, that is to say, at the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and deducting therefrom the probable annual average cost of insurance and other expenses (if any) necessary to maintain the property in a state to command such rent. Provided that no rateable property shall be computed as of an annual value of less than Five pounds per centum upon the fair capital value of the fee simple thereof.

In the case of certain Crown lands held for pastoral purposes only, the provision that the annual value must not be less than five per cent. on the capital value does not apply, but the occupier is rated on the actual net annual value of the property.

The object of the proviso that the annual value is not to be less than five per cent. of the capital value is to impose a larger and more appropriate share of the burden of municipal taxation on unimproved or partially improved properties than would be payable in respect of such properties if the valuations were based on the rentals. For example, vacant land or land with inferior or dilapidated buildings thereon which, although worth £5,000, is only capable of producing a net rental of say £100, is not assessed at that sum, but at £250. It is considered by some that even under this system an unfair share of municipal revenue has to be paid by persons who improve their properties by the expenditure of labour or capital thereon, and a measure was recently passed by Parliament (*Rating on Unimproved Values Act 1914*) giving the option of exempting improvements from rating and of rating on the value of the land only. If a council proposes to adopt, or if it refrains from adopting, this method of rating a poll of the ratepayers may be demanded. The proposal is carried if a majority of the votes recorded are in favour of adoption and the total votes recorded form one-third at least of the total number of voters enrolled. In the same way an adopting proposal can be rescinded and rating on unimproved values discontinued.

Every council must once at least in every year make a general rate equally in respect of all rateable property. General rates must not in any year be less than 6d. nor exceed 2s. 6d. in the £1, unless that amount is increased to raise moneys required under the *Fire Brigades Act 1890* (section 44) or the *Workers' Dwellings Act 1914* (section 7).

An extra rate may be made exclusively upon properties within one or more subdivisions or any portion or portions thereof. An extra rate cannot be made except in accordance with a requisition signed by not less than two-thirds of the councillors of any subdivision affected by such rate. Extra and general rates in any subdivision must not in any year together exceed 2s. 6d. in the £1.

A separate rate may be made where it appears to the council that any authorized works or undertakings are for the special benefit of a particular portion of the municipal district. No such rate can be made unless a petition is received from a majority of occupiers and one-third at least (in number and value) of the owners of property in respect of which it is proposed to make the rate. A separate rate is not of any force or effect until it is confirmed, either with or without variation, by the Governor in Council. For the purpose of carrying out the works and undertakings for which a separate rate was made, money may be borrowed for any period not exceeding sixteen years on the security of the rate, either by mortgage or the issue of debentures. A separate rate continues to be payable in every year until the moneys borrowed (and interest thereon) have been repaid.

Water rates, sanitary rates, and tramway rates may be made (see under headings "Water Supply," "Councils as Sanitary Authorities," and "Tramways," pages 180 to 182 *post*). The *Country Roads Act 1912* (section 36), authorizes the making of special rates, but provision can be made in a general rate for moneys required under that Act.

An appeal may be made to a Court of Petty Sessions against a rate on the ground of unfairness or incorrectness in the valuation of any rateable property

or in the amount assessed thereon. For any cause of grievance, including the grounds just mentioned, if the net annual value of the property as stated in the rate amounts to £50 or more, an appeal may be made to the next County Court held nearest to the rateable property. Written notice of intention to appeal has to be given within one month after the making of the rate.

The person primarily liable for the payment of rates is the occupier, or, where there is no occupier, or where private property is occupied by the Crown or a public body exempt from rating, the owner of the rateable property. An occupier who pays rates may (unless under an agreement the rates are payable by him) deduct the amount from his rent or recover the same by action of debt.

Where the person primarily liable fails to pay rates or other moneys due to the municipality, the council may recover the same, by legal process, from the owner for the time being or the occupier for the time being of the property. The Act also contains provisions regarding payment and recovery of rates to meet special circumstances. There is now no power of distraint by the council without an order of the court being first obtained.

Where property is unoccupied and rates or other moneys due to a municipality have been unpaid for five years, the council may take possession of the property and lease it for terms of not more than seven years. The council has to keep an account of moneys received and paid, and after payment of the amounts due to the municipality the residue belongs to the owner of the property, but if not claimed within thirty years from the date at which possession was taken such residue and the property as well vest in the municipality.

Rates and other moneys owing to a municipality bear interest at the rate of £6 per cent. per annum, if not paid within a certain time after they become due. In the case of rates, the period is six months, and, in the case of other moneys, usually one month.

Rates and other moneys (including interest thereon) are a charge on the land in respect of which they are due, and for the purpose of enforcing such charge proceedings may be taken in the Supreme Court or any County Court, and the Court may order the sale of the whole or any part of the land subject to the charge.

The writer considers that it is desirable, whilst dealing with the subject of rates, to emphasize the fact that at a very early date a departure was made from the original scheme of local government which provided that one-half of the cost of the police should be a charge upon local revenues, and that the establishment and support of schools should be undertaken by councils. And further that later Acts empowered, but did not compel, councils to contribute towards the establishment and support of hospitals and asylums, and in other ways to give charitable relief. With respect to these matters, the municipal systems of Victoria and other parts of Australia differ from those of Great Britain. Police, education, asylums for insane, and the subsidizing of charitable institutions are here regarded as functions of the State, and not of the municipalities, although for certain kinds of schools, and for charitable purposes, moneys are voluntarily given by municipalities.

This difference of policy accounts to a considerable extent for the disparity between the amounts in the pound of the rates levied in Great Britain and those levied in Victoria.

In 1912 the total proceeds of municipal rates in all municipalities was £1,103,210, the average rates being—in cities, towns, and boroughs, 1s. 9½d. in the £1; and in shires, 1s. 3d. in the £1. In the same year there was paid out of public revenue for police, £316,456; for State schools, £985,633; for technical schools, £36,871; for asylums for the insane, £246,234; and for charities, £224,354, making a total of £1,809,548. It will thus be seen that if the municipalities had been required to pay those amounts, the rates which they would have had to levy would have been increased by over 150 per cent.

Borrowing Powers.

It has been a gratifying feature of municipal administration in Victoria that from the inception of local government to the present time no municipality has failed to repay moneys which it has borrowed.

Councils may, by the issue of debentures, borrow for not more than forty years upon the credit of the municipality for permanent works or undertakings, or to liquidate moneys owing on account of a previous loan.

Borrowing is authorized for (amongst other things)—making or opening streets, or diverting, altering, or widening streets; bridges, culverts, levees, ferries and jetties; sewers and drains; waterworks, electric light works and gas works; municipal offices, pounds, abattoirs, markets, baths, wash-houses, pleasure grounds, libraries, museums, hospitals and asylums; tramways; refuse destructors, and plant and appliances for removal and treatment of nightsoil; also for the purchase or compulsory taking of land.

The amount so borrowed is not at any time to exceed ten times the average income of the municipality for the previous three years from general rates not exceeding 1s. 6d. in the £1. But, in addition, loans having a currency of not more than thirty years may be raised upon the security of certain income, and not upon the credit of the municipality, by the issue of debentures or by mortgage. These loans are not to exceed five times the average amount of such income. The *Workers' Dwellings Act* 1911 gives additional borrowing powers for the purposes of that Act.

Certain notices have to be given and other formalities observed before loans can be raised. If a poll of ratepayers is demanded, and at such poll at least one-third of the enrolled ratepayers vote against the loan, the council is forbidden from proceeding further in the matter.

The liquidation of some municipal loans is provided for by a sinking fund formed by the investment annually in Victorian Government Stock of at least £1 10s. per cent. of the principal moneys. Where this is not done, the loans are gradually liquidated by annual repayments of the principal, the series of debentures issued having a varying currency, and falling due from year to year.

For the temporary accommodation of a council, it is permitted to obtain an advance from a bank, upon the credit of the municipality, by overdraft of the current account. Such overdraft is not at any time to exceed one-half of the prior year's revenue.

Councils are also empowered to borrow on the security of separate rates and special improvement charges, further references to which are made elsewhere.

If the council borrow illegally, the councillors who consented to such borrowing are jointly and severally liable to repay the same and all interest thereon. In addition to this every councillor who consented to the illegal borrowing is liable to a penalty of £200.

In 1912, the indebtedness of the municipalities, according to the figures given in the *Victorian Year-Book*, was as follows :—

		Due to the Government.	Due to the Public.
		£	£
Cities, Towns, and Boroughs	..	135,182	4,177,710
Shires	..	67,853	631,205
Total	..	<u>203,035</u>	<u>4,808,915</u>
Grand Total	..	£5,011,950	
Less Sinking Funds	..	897,944	
Net Indebtedness	..	<u>£4,114,006</u>	

Of this the following sums were raised in the last five years :—

Year.			Amount of Loan.
1908	..	..	£47,600
1909	..	..	36,653
1910	..	..	396,335
1911	..	..	101,918
1912	..	..	284,234

The average rate of interest paid on municipal loans is £4 3s. per cent per annum.

The loans due to the Government, authorized by special Acts, were principally for waterworks, tramways, drainage and reclamation works, and bridges.

Accounts and Audit.

Councils are required to cause books of account to be provided and kept in a form appointed by the Governor in Council. This secures uniformity in the method of book-keeping, and it also facilitates the audit of accounts. All books and accounts may be inspected by any ratepayer or creditor of the municipality. The accounts have to be balanced to the 30th September of each year. An annual statement has to be prepared containing an account of all rates made, contracts entered into, moneys received and moneys paid by the council during the year, and of all assets and liabilities of the municipality. After the statement has been audited it has to be printed and allowed to remain for inspection at the office of the council. The accounts so balanced and audited, and either allowed or disallowed by the auditor, and the statement, have to be produced at a meeting of the council held not later than six weeks after the completion of the audit. At this meeting ratepayers, creditors, or other persons interested may be present. The accounts have then to be finally examined and settled by the

council, and, if the same are found just and true, they are allowed by the council, and certified accordingly under the hand of the chairman of the meeting, after which such accounts are final in regard to all persons whomsoever. An abstract of the accounts has to be prepared and published in a newspaper circulating in the municipal district, and has also to be kept at the office of the council.

Directions are given by the Act to collectors and other officers as to the manner in which, and the time when, moneys received by them have to be paid to the treasurer of the municipality, and as to the payment by him into the bank of such moneys. Moneys cannot be withdrawn from the bank save by cheque signed by three councillors, and countersigned by the municipal clerk.

Officers are subject to penalties for failure to comply with the provisions of the Act relating to payment of moneys received by them, to furnishing proper accounts thereof, and to the delivery of vouchers and receipts.

Two inspectors of municipal accounts, appointed by the Governor in Council, visit the municipal offices throughout Victoria at varying intervals during the year and make an examination of the books. In addition an annual audit is made. The auditor is also appointed by the Governor in Council, and to be eligible for appointment he must be the holder of a certificate issued by the Municipal Auditors' Board.

The Governor in Council, if requested in writing by not less than twenty ratepayers, who have deposited such sum not exceeding £50 as the Minister may require as security for costs and expenses, or without such request or deposit, may appoint for any municipality a special auditor or auditors. The certificate of a special auditor that moneys have wilfully or through culpable negligence been missapplied, if confirmed by the Governor in Council, is conclusive evidence in all courts of the fact of misapplication. A law officer or any ratepayer may recover the misapplied moneys from any one or more of the councillors who missapplied the same or who connived at or concurred in the misapplication. Moneys so recovered have to be paid into the municipal fund.

Contracts.

Councils may make contracts in the mode prescribed, but, except in cases of emergency, before a contract can be entered into for the execution of any work, or the furnishing of any goods, to the amount of £100 or upwards, tenders must be publicly invited. The council may accept the proposal which, on a view of all the circumstances, appears to it to be most advantageous. Security for the performance of the contract has to be taken. Councils may compound with persons who have entered into contracts, or by or against whom any action or suit has been brought against or on behalf of the municipality for any cause whatsoever.

Before making a progress or final payment, the council may require the contractor, or some person on his behalf, to make a statutory declaration showing whether all workmen and labourers employed on the work have or have not been paid their wages in full to the latest practicable date at which such wages are due. If a declaration shows that wages are owing, the council may pay the same out of the moneys due to the contractor.

With the approval of the Governor in Council a contract may be made between the council of a municipality and any other body corporate or public body for or with respect to the doing and the control and management of any matter or thing which the contracting parties or either of them is by law empowered to do, control, and manage.

Purchasing, Leasing, or Compulsory Taking of Land.

For the purpose of executing an authorized work or undertaking, the council of a municipality may purchase or lease land or any easement, right, term, or privilege in, over, or affecting land. Subject to the confirmation of the Minister, the council may, if necessary, make an order compulsorily taking land or any easement or interest therein. If the land proposed to be taken is not within the municipal district, the consent of the Governor in Council has to be obtained. Plans have to be prepared and notices published and served 40 clear days before the making of an order by the council. Any person affected by the proposed work or undertaking, or his agent or manager for the property so affected, who has set forth his objections in writing, may appear before the council in support of such objections. The Minister may confirm an order with or without variation or he may disallow it. Notice of the confirmation or variation of an order has to be published in the *Government Gazette*. Upon the confirmation of the order, and not before, the council may take and use the land, making full compensation to the owners and any person interested. If the amount of compensation is not agreed upon it has to be ascertained and determined in the manner provided by the Act.

Construction, Maintenance, and Control of Public Highways, Bridges, Ferries, etc.

Before the creation of local government institutions, roads and bridges were constructed by the Crown, or the central Government. When local governing bodies were brought into existence a right to make and maintain roads was specially reserved to the Government, and that right is still continued by the existing statutes. This power has been used occasionally even in recent years, not, however, as the assertion of a "right," but principally as a means of providing, through large areas of Crown lands, necessary roads, the construction of which the local municipal councils could not reasonably be expected to undertake.

A large proportion of the revenue of Victorian municipalities has, in every year since the inception of local government, been expended on road construction and maintenance. Of the total amount of £1,945,516 received in 1912, £1,072,174 was used by councils in making and repairing public roads.

The council of a municipality may within its municipal district, or, with the consent of the Governor in Council, in any part of Victoria, make, improve, and maintain public highways, bridges, ferries, levees, or jetties; or open new streets and roads; or alter or increase the width of, or divert, a street or road.

It is the duty of the council to see that roads are kept open for public use, and the court will, if necessary, issue a *mandamus* to compel the

performance of this duty. Roads, however, which are not required for access to lands which they adjoin, and are not otherwise required for public use, may be sold by the Governor in Council to the owner of the adjoining land. Under the provisions of the *Unused Roads and Water Frontages Act* 1903, every council has to furnish returns of the roads in its district which are not fenced off on both sides, and which it considers are not required for public traffic. Licences to occupy such roads must be taken out by owners of adjoining lands, and an annual rental paid. Licences are not granted for a longer term than three years, and they may be terminated before the expiry of the term if the road is required for public use. Provision is also contained in the Local Government Act for the granting by the Governor in Council of a "swing gate" licence where the traffic is so slight that the temporary closing of the road would not create inconvenience.

Roads may be closed whilst construction or maintenance works are being carried out, and for such time thereafter as may be necessary to prevent injury to the works. On the certificate of the municipal surveyor or engineer that a road, bridge, or culvert is unsafe, the council may close it against traffic, but the Governor in Council may direct the re-opening of a road, bridge, or culvert so closed.

Where extraordinary expenses have been incurred in repairing a road damaged by an excessive weight passing along the same, such expenses may be recovered from the person by whose order the weight was carried over the road. For the purpose of preventing damage a council, after obtaining a report from its surveyor or engineer, may fix the maximum weight which may be carried over a bridge or culvert. In addition to the penalty imposed, damages for injury caused by a weight in excess of that fixed by the council are recoverable.

As a means of lessening injury to roads, the Governor in Council, at the request of the council, may apply to a municipal district, or any part thereof, provisions of the Act by which the weight to be carried on a vehicle is determined by the width of the tires on its wheels. Ordinarily the weight allowed (including the weight of the vehicle) is—for each wheel of a two-wheeled vehicle, 4 cwt., and for each wheel of a four-wheeled vehicle, $4\frac{1}{2}$ cwt., for each half-inch of width of bearing surface of the tire or felloe. The Governor in Council, on the application of a municipality, may, in special circumstances, reduce the weight for particular localities, and he may also make regulations for declaring the weight by measurement of any specified goods. The use of traction engines on public highways is subject to certain statutory restrictions, and councils may, in addition, make by-laws for regulating the hours during which, and the conditions on which, traction engines may proceed over streets or roads.

Materials for construction or maintenance of roads may be taken from Crown lands set apart for that purpose, or they may be taken (subject to the payment of compensation) from private lands, excepting at such places as the site or curtilage of a house or a garden.

Persons who displace, take up, or make any alteration in the soil or materials of a road, or who make any obstruction thereon, are liable to penalties, and the council may cause any building, hedge, ditch, fence, hole,

heap, drain, or other obstruction to be removed, filled up, or otherwise made good at the expense of the person by whom it was made or to whom it belongs.

In cities, towns, and boroughs, and in shires or parts of shires, to which provisions relating to the fixing of levels have, by a local by-law, been made applicable, it is the duty of the council to fix the levels of streets. If not altered on appeal, the levels fixed are to be kept thereafter by any person erecting a house or other building in the street. Plans have to be prepared and certain notices given. A time is fixed for the hearing and determining of objections by persons interested, and an appeal to a police magistrate is allowed against any order made by the council. If after the level of a street has been fixed any alteration is made, the municipality has to make full compensation to all persons interested in any property injuriously affected by the alteration.

Before new streets can be laid out on private property, a plan has to be submitted to enable the council to ascertain whether such streets and the lands abutting thereon can be sufficiently drained. The Municipal Association of Victoria has recommended that councils should be given fuller powers to regulate the subdivision of land into building allotments. The Association is also considering the advisability of endeavouring to obtain the introduction of legislation on the lines of the English Town Planning Act.

Any street, lane, yard, or passage, or other premises formed or set out on private property, or any street, lane, or passage formed or set out on land of the Crown or any public body for the purpose of back access or drainage (whether the same respectively is a public highway or not) may be constructed by the council at the cost of owners of adjoining lands. Plans and specifications and an estimate and scheme of distribution of cost are prepared. Notice is given to all persons intended to be made liable, and an opportunity is afforded them of raising objections before the plans, &c., are adopted by the council. If a street 33 feet wide at least has been once constructed under these powers, it is thenceforth under the care and management of the council, and the liability of owners of adjoining lands ceases. Streets, lanes, &c., of a less width than 33 feet wide may, however, be kept in repair or from time to time constructed at the cost of the owners of adjoining land. When a construction order is made, the amounts due in accordance with the council's apportionment of the estimated cost of the works become immediately payable. The council may allow time and receive money due by any owner in annual instalments over a period of not more than seven years, charging interest at the rate of £6 per cent. per annum. Or a special improvement charge may be made in respect of the properties comprised in the scheme. This charge is levied rateably on properties having regard to the period of time during which it is to continue, and in proportion to the amount of the cost of the works apportioned to each of them. Sufficient money is borrowed, by mortgage or debentures, on the security of the charge to carry out the works. Payments by owners on account of the charge are made annually and must be fixed at amounts which will be sufficient to repay the loan and interest in such time, not exceeding sixteen years, as the council may determine.

One half of the expense of kerbing, flagging, paving, or asphalting footpaths along public or private streets, which have not previously been kerbed, flagged, &c., is payable by and recoverable from the owners of properties abutting on such footpaths. Owners may also be required to fence or to make secure dangerous holes or excavations near streets, or to raise the level of low ground to the level of the adjoining street.

Municipalities are bound to unite in making or repairing a boundary road or in building and maintaining a bridge, culvert, or ferry across a river, stream, or watercourse on their common boundary. In default of agreement, a council may serve a notice to treat on the other council or councils concerned. If for the space of one month after the giving of such notice the councils fail to agree, any one of them may apply for a summons calling on the others to show cause to a police magistrate, sitting in a Court of Petty Sessions, why the work mentioned in the notice should not be executed. The court may determine whether or not such work shall be done, apportion the work between the municipalities, or direct one municipality to execute it and the other municipality or municipalities to pay thereto portion of the cost, and in like manner to provide for future maintenance and repairs.

The provisions just referred to provide effective means by which two or more councils can deal with matters relating to boundary roads and bridges. But, for many years, it was realized that the Act was deficient with regard to the control and management of roads, other than boundary roads, in which a number of councils have an interest in common, though, perhaps, in varying degrees. Under our system of local government, municipal attention and effort were too much localized. Bodies performing functions akin to those of county councils and similar authorities do not exist in Victoria. This defect has been felt particularly by councils in whose districts there are roads which have to carry a heavy through traffic. They urged that some plan should be devised that would enable the burden of expense in making and repairing these roads to be more equitably distributed. In view of the importance, from a national stand-point, that the main arteries of traffic shall be properly made and maintained, the proposal that there should be a special appropriation of public funds to assist municipalities to improve main roads had many advocates. The necessity for further legislation was realized by the Government and Parliament, with the result that the *Country Roads Act 1912* was passed.

COUNTRY ROADS ACT 1912.

When this measure was introduced by the Government, it was announced that its object was the inauguration of a policy of co-operation between the central and municipal governments in securing uniform construction and maintenance of the principal traffic-bearing highways of the State. The board consists of a chairman and two members, all of whom are appointed by the Governor in Council. One of the principal duties of the board is to declare the roads which in its opinion are of sufficient importance to be main roads. Before the declaration of a main road, the councils interested have to be consulted, and each council has a right of appeal to the Minister for Public Works, who can vary or disallow the decision of the board. A resolution

of the board declaring or discontinuing a main road has to be confirmed by the Governor in Council before it comes into force. The board has to make investigations regarding the nature and extent of the resources of the State in materials suitable for road-making and maintenance, and the most effective and economical methods of utilizing them. Other duties of the board are to ascertain the most effective methods of road construction and maintenance, and what deviations in existing roads, or what new roads, are necessary to facilitate communication and improve the conditions of traffic. Authority is given to the board to purchase all land, machinery, tools, implements, and materials needed for the purposes of the Act, but no contract involving an expenditure of more than £1,000 can be entered into without the written consent of the Minister.

The board prepares the plans and an estimate of the cost of constructing a main road, and, if the Governor in Council approves of the same, the work is carried out by the council of the municipal district in which the main road is situate, unless the Governor in Council directs that the work shall be done by the board. The council maintains the main roads within its municipal district unless the Governor in Council directs the board to do so. The board has in each year to notify the amount which the council may expend on the maintenance of each of the main roads within its district.

Every year the board has to determine which municipalities have benefited by the permanent works and maintenance carried out on main roads during the preceding year, and to decide what proportion of the total amount expended shall be allocated to each municipality, having regard to the benefit it has received. The board then fixes the contribution which each municipality has to pay in respect of the proportion so allocated. The contributions need not be at a uniform rate, but may be varied in the case of each municipality according to its ability to pay, provided that no municipality shall pay more than two-thirds of the proportion allocated to it, and provided further that the contributions payable by municipalities must, in the aggregate, equal half the amount expended. A municipality may be required to contribute in respect of works on a main road outside its district, if substantial traffic to or from the district passes over the road. Expenditure on permanent works and maintenance have to be kept distinct and to be separately apportioned.

Before an apportionment is made the board has to furnish particulars to the council of each municipality proposed to be made liable. The council may give notice of objection and be represented at the hearing thereof by the board, and it also has the right of appeal to the Minister against the decision of the board as to the amount which it shall pay.

The Act provides for the borrowing by the Government of the sum of £2,000,000 to be expended on the construction of main roads. Of this amount, which is to be raised in five annual instalments of £400,000 each, £1,000,000 is granted by the State to the municipalities, and the other £1,000,000 is a loan to them, repayable in $3\frac{1}{2}$ years. Each municipality pays 6 per cent. per annum on the amount of its apportioned share of expenditure on construction; of this sum $4\frac{1}{2}$ per cent. is charged as interest and the balance of $1\frac{1}{2}$ per cent. is used to form a sinking fund.

The sum to be expended annually on the maintenance of main roads is not fixed by the Act, but, of the amount which it is found necessary to spend, one-half will be contributed, in accordance with the apportionment made by the board, by the municipalities benefited. The other half will be chargeable to the Country Roads Board Fund derived from fees and fines under the *Motor Car Act* 1909, fees for the registration of traction engines, moneys received under the *Unused Roads and Water Frontages Act* 1903, and moneys appropriated by Parliament for the purposes of the Act. The amount for which a municipality can be made liable under the Act is not in any year to exceed a sum equal to that produced by a rate of sixpence in the pound on the net annual value of the rateable property in its district. The amount may be paid out of the municipal fund or a special rate may be made to meet it. If a municipality makes default, the board may levy a rate to pay the amount owing. The materials of all main roads, and all matters and things appurtenant thereto, belong to the board. The board is given powers of controlling and managing main roads similar to those possessed by councils with regard to ordinary highways, but, save in so far as is inconsistent with the Act, a municipality has the same powers over main roads within its district as it has over other roads.

The Act contains a provision regarding the hours to be worked by any unskilled adult workman employed by the board and the rate of wages he has to be paid.

The board has annually to present a report to the Minister, giving particulars of the roads constructed and maintained during the year, and an account of all the moneys which it has received and expended.

Sewers, Drains, and Watercourses.

Public sewers and drains within a municipal district are vested in the municipality, and the council has the management and control of them. The council may, in or through any land within or adjoining its district, make, cleanse, and keep open, such ditches, gutters, tunnels, drains, and watercourses as it thinks fit, making compensation for damage done to lands entered upon for any of these purposes. The Act contains provisions regarding the construction of underground sewers, but in many respects they are inadequate. This is an instance of the Act being deficient in effective machinery to enable a number of councils to act in combination. Very often drainage problems must be dealt with irrespective of municipal boundaries. Special legislation was passed to provide for the sewerage of the municipal districts comprised in the metropolitan area by the Melbourne and Metropolitan Board of Works. This body is constituted of representatives of the councils of the municipal districts within the area sewered, and it also owns and controls the metropolitan water supply. Under a special Act a Trust has been created to control and manage water supply and sewerage works in the city of Geelong and some of the surrounding municipal districts. There has just been prepared for the consideration of Parliament a Bill to provide means by which the establishment and control of sewerage works may be undertaken in any populous part of Victoria other than the places above mentioned.

Light, Heat, and Motive Power.

A municipal council may construct or purchase gasworks, electric light works, or other works for the supply of light, heat, or motive power for public or private purposes within its district. If it is desired to extend the supply outside the municipal district, the consent of the Governor in Council has to be obtained.

Contracts for a period not exceeding fourteen years may be made for the supply to the municipality of gas, electricity, or other means of lighting.

Electrical works owned by municipalities, as well as those belonging to private owners, are subject to the provisions of the Electric Light and Power Acts.

Councils are empowered to make a charge to be paid by persons supplied with light, heat, or motive power for private purposes.

Water Supply.

Municipalities are empowered to purchase or construct and to maintain waterworks. They may also make contracts, for periods not exceeding ten years at any one time, with the owners of waterworks for the supply of water. With regard to certain matters the consent of the Governor in Council has to be obtained.

Councils are authorized to make by-laws regulating the use of municipal waterworks, and by special order they may make a water rate, which is not to exceed 2s. in the pound, but a minimum sum of 10s. may be imposed in respect of any property at which water is supplied.

These powers have been exercised in some municipal districts, but works for the supply of water are not usually established by municipalities. Such works are, in most localities, owned and controlled by a Waterworks Trust or other authority constituted under the Water Acts.

Prevention and Extinction of Fires.

Municipal funds may be appropriated for providing and maintaining works, machinery, and assistance for securing an efficient supply of water in case of fires. Councils may arrange also for the necessary labour and assistance for extinguishing fires, and they may make contributions in aid of fire brigades.

The operation of these provisions is now limited, as under the *Fire Brigades Act* 1890 a metropolitan fire district and nine country fire districts have been constituted. In the portions of Victoria within fire districts, the Metropolitan Fire Brigades Board and the Country Fire Brigades Board respectively have the duty of taking, superintending, and enforcing all necessary steps for the extinguishing of fires and for the protection of life and property in case of fire, and the general control of fire brigades. The expenditure of the board in each fire district is contributed as follows:—One-third by the Government, one-third by the Municipalities within the fire district, and one-third by the Insurance Companies doing business therein.

Markets and Weighbridges.

The provisions relating to markets in Victoria were evidently modelled on those of the *Markets and Fairs Clauses Act* 1847 (England). Councils are authorized to provide market places and all matters and things necessary for their convenient use.

Before a market can be opened, notice has to be given by the council, and two justices, one of whom has to be a police magistrate, must certify that the market place is complete and fit for use. After the establishment of a market, a person is liable to a penalty if he sells or exposes for sale in any place in the municipal district, other than his own premises or yards licensed for the sale of cattle, any article or any cattle in respect of which market tolls are payable.

Stallages, rents, tolls, and dues not exceeding amounts fixed by the Governor in Council may be demanded. The council may demise or let to farm such stallages, &c., for a term not exceeding three years.

The council may provide weighbridges or weighing machines within or without the municipal district, and may license private weighbridges and weighing machines.

Power is given to the council to make by-laws relating to markets or weighing machines.

Tolls.

Prior to 31st December, 1877, power existed for the collection of tolls by councils from persons using certain public roads and bridges. Considerable amounts were obtained by municipalities from this source, but, although an effective method of collecting revenue from the persons who used the roads, it was very unpopular, and public agitation resulted in the repeal of the law. The payment of tolls can now be enforced only at a punt or floating bridge which requires the attendance of some person in charge.

Councils as Local Sanitary Authorities.

Under the Health Acts, large powers are conferred on municipal councils. It is the duty of the Board of Public Health, which consists of a Chairman appointed by the Governor in Council and of seven representative members elected by groups of municipalities, to enforce and carry out the provisions of the Health Acts throughout the State, but local health administration largely devolves upon municipal councils. Every council has to appoint a legally-qualified medical practitioner as officer of health, also such analysts and inspectors as the board may require. Councils may make orders for enforcing the provisions of the Act, and, with the approval of the board, may make by-laws, not only on subjects specified, but generally for the abatement and prevention of nuisances and for securing the healthfulness of their districts. The matters with which councils are empowered to take action relate, amongst other things, to adulterated and unwholesome food and drugs, abattoirs, dairies, common lodging-houses, unhealthy and over-crowded dwellings, infectious and contagious diseases, offensive trades, public buildings, drainage, removal and disposal of nightsoil and garbage, and suppression of nuisances.

A council may make a rate not exceeding sixpence in the pound on all or any rateable property for the purpose of providing for the removal of nightsoil within the district, or any part thereof, and may direct that the minimum amount payable in respect of any one separate tenement shall not be less than ten shillings. Or in lieu of a rate the council may make an annual charge, to be levied only on the occupiers of tenements in which nightsoil pans are in use.

Tramways.

Under the *Tramways Act* 1890, the councils of municipal districts, other than those named in the Second Schedule to the Act, may obtain orders authorizing them to construct tramways. With the approval of the Governor in Council, an order may be delegated by a council to any person or corporation, unless on a poll of the ratepayers a majority forbids the delegation. The districts mentioned in the Second Schedule were excepted, as an earlier Act had authorized the construction of tramways in those districts by a Trust representative of the municipalities. The tramways referred to are the cable tramways in Melbourne and some of the inner suburbs, and also the horse tramways in Hawthorn and Kew. The cable tramway in the Town of Northcote, the horse tramway in the Town of Coburg, and the steam tramway in the Shire of Kerang, are the property of those municipalities. The electric tramways in the eastern suburbs of Melbourne are owned by a municipal trust, constituted under a special Act. The Essendon electric tramways and those in the provincial centres of Ballarat, Bendigo, and Geelong, as well as several small tramways in various parts of the State, were constructed and are operated by private companies or individuals under orders delegated to them by the municipalities. The electric tramway from St. Kilda to Brighton, although constructed along public highways, is not a municipal undertaking, but is connected with the Victorian Government railways system. The Tramways Act provides for the making of advances out of the "Country Tramways Trust Fund" for the construction of tramways in country districts, and empowers a shire council to make a tramway rate for the purposes of the Act.

Workers' Dwellings.

The *Workers' Dwellings Act* 1914 empowers a council to acquire land in its municipal district and to erect thereon dwelling houses for leasing to persons who are not owners of dwelling houses, and who are not in receipt of incomes of more than £200 a year. Sub-letting by tenants is not permitted. In fixing rents the council has to take into account interest, depreciation, rates, repairs, and insurance. The council may, with the approval of the Governor in Council, borrow for the purposes of the Act, over and above the amount which it is authorized to borrow under any Act, any sum or sums of money not exceeding in all £50,000. Plans and specifications, and an estimate and statement have to be submitted by the council for the approval of the Governor in Council. With the like approval, by-laws may be made by the council for carrying out any of the purposes provided for in the Act. Once in every year a balance-sheet has to be prepared showing receipts and expenditure, and assets and liabilities of all operations undertaken by the council during the previous year.

Other Powers.

Municipal councils may provide public baths and washhouses and afford the use of the same, either with or without charge, on such conditions as may be fixed by by-law.

They may construct and erect such buildings, fences, and appliances as may be necessary for the purpose of all pounds established by the council within the municipal district, and all abattoirs which the council are under any law empowered to provide, and may purchase or lease any land necessary for such purposes.

They may either within or, with the consent of the Governor in Council, without the municipal district, provide pleasure grounds, public schools, libraries, museums, gymnasiums, gardens, or places of public resort or recreation. They may also aid in erecting, establishing, and maintaining local athenæums, mechanics' institutes, museums, and libraries not conducted for the purpose of private profit. The *Municipal Grounds Act* 1905 empowers a council, with the approval of the Governor in Council, to make by-laws or regulations for imposing, collecting, and receiving charges or entrance fees for clubs, associations, or persons using or entering pleasure grounds or places of public resort or recreation. The by-laws may also authorize the holding of musical performances and the making of a charge for admission thereto. Under the provisions of the *Sports Betting Suppression Act* 1901 wagering or betting in grounds or reserves in which sports are being held can be prohibited.

They may aid hospitals, asylums, or other institutions for the relief of the poor, or may grant relief to the poor at their own homes or elsewhere.

They have to enforce the *Dog Act* 1890 and to appoint officers necessary for that purpose. They may appoint inspectors whose duty it shall be to insure that the provisions of the *Bakers and Millers Act* 1890 (and 1893) relating to the sale of bread are carried out. Under the *Thistle Act* 1890 they have certain duties imposed upon them with regard to the eradication of noxious weeds. They have also to carry out provisions contained in the *Weights and Measures Act* 1890 (and 1912), the *Coal and Firewood Act* 1904, the *Police Offences Act* 1912, the *Butchers and Abattoirs Act* 1890, the *Meat Supervision Act* 1900 (and 1901 and 1909), the *Pure Food Act* 1905, the *Pounds Act* 1890 (and 1912), the *Drainage Areas Act* 1898 (and 1905 and 1906), the *Land Draining Facilities Act* 1907, the *Vermilion Destruction Act* 1890 (and 1897, 1899, 1901 and 1904), the *Wire Netting Act* 1909, as well as more or less important provisions of several other Statutes.

Legal Proceedings.

Legal proceedings by and against municipalities are regulated by certain provisions, the conditions under which actions may be brought against municipalities in respect of accidents upon highways, bridges, ferries, and jetties being specially defined. The mode, in which compensation payable in consequence of the exercise by a council of any of its powers shall be determined, is also prescribed. When a difference arises between two or more municipalities (other than such differences as are otherwise expressly provided for) the matter in dispute cannot be made the subject of litigation in the ordinary way, but it has to be referred to the Minister, whose decision is final and may be made a rule of the Supreme Court.

The Judges of the Supreme Court are empowered to make rules to regulate the procedure and practice of the court in matters under the Local Government Acts, and the Governor in Council has power to prescribe forms of notices or orders to be given or made by councils.

Municipal Association of Victoria.

In carrying out their duties as governing bodies of particular localities, municipal councils felt the need of an organization which would bring together representatives of the municipalities throughout Victoria to discuss questions of municipal policy and administration, and to take united action with respect to matters affecting the interests of municipalities generally. The Municipal Association of Victoria was therefore established in 1879 to promote the efficient carrying out of municipal government, and to watch over and protect the interests, rights, and privileges of municipal corporations. The Association was incorporated by the *Municipal Association Act* 1907, under which the council of each municipality is empowered to appoint a councillor to be its representative. The representatives so appointed constitute the Association.

An annual session is held to consider proposals submitted for discussion by councils, and to make recommendations regarding amendments of municipal law which are deemed desirable. Expression is also given to the views of the municipalities with respect to any measures before Parliament which affect local governing bodies. A President and Executive Committee and other office-bearers are appointed to manage the general affairs and business of the Association.

The incorporating Act authorized the Association to establish a Municipal Officers Fidelity Guarantee Fund, which has now been in operation for six years and has been very successful. Guarantee policies have been issued by the Association to every municipality in the State. In respect of guarantees in force during the six years ended 30th September, 1913, the total premiums received amounted to £5,261 7s. 6d., whilst the losses under the guarantees amounted to £1,027 12s. 6d. only.

Scope and Operation of Local Government in Victoria.

Much wisdom and foresight were shown by the Parliament which, after the trial and abandonment of certain tentative and experimental provisions, selected what may now be regarded as the first permanent legislative machinery for controlling municipal affairs in both urban and rural districts of Victoria. Subsequent Parliaments, recognising the public spirit that has been evinced by municipal councillors, the energy they have displayed, and the efficient services they have rendered, without remuneration and in a completely honorary capacity, have readily extended the functions of municipalities. Thus the comparative freedom from friction with which local government was carried on, and the large measure of success which it achieved, prepared the way for the bestowal upon local governing bodies of the very extensive and important powers and duties with which they are now intrusted.

The Royal Commission which, in 1902, considered and reported on the subject of local government laws summarized its views with regard to the operations of municipalities and the legislative enactments by which they are governed, as follows :—

" After mature consideration, we find that the scheme of local government which was initiated in Victoria by the 'Municipal Institutions Act of 1851,' and which has been continued and developed with the progress of the State, has resulted in the establishment of an efficient and satisfactory system of local government. The powers given to local bodies by the early enactments were extensive, and have from time to time been largely increased, so that they now embrace practically all matters which are included in the most advanced systems of local government in operation in the United Kingdom and other parts of the world. Two hundred and six municipalities have been constituted under the Local Government Acts, and the districts under their control, with a trifling exception, now extend over every portion of the State. Councillors, ratepayers, and municipal officers have become familiarized with the leading principles of the laws which regulate the management of local affairs. We do not, therefore, suggest alterations which would effect any radical change in the main features of the existing municipal system, but, at the same time, our investigations have enabled us to recommend many important amendments which will remove practical difficulties, facilitate efficient administration, simplify procedure, and secure greater economy in carrying on municipal government."

The opinion then expressed by an official and expert body, after lengthy investigation and deliberation, still receives general endorsement. The recommendations which were made by the Commission were adopted, and all that is now necessary is the enactment of certain supplementary provisions which experience during the past few years has shown to be desirable. There is reason to believe that these matters will receive the consideration of Parliament at an early date.

In Victoria, there is no Local Government Board. Many matters which in England engage the attention of the Local Government Board are dealt with here by the Governor in Council or the Minister for Public Works. Capable and sympathetic administration by the Local Government Branch of the Public Works Department created and has maintained a harmonious relationship between the central government and local bodies; and, on the whole, the system has proved satisfactory. Increased population in the future, and the resultant expansion of municipal activities, will probably show that the establishment of a local government board could be made the means of bringing about improved and more uniform methods, and of securing even greater efficiency in the carrying on of local government throughout the State.

Carefully prepared and informative statistics relating to municipalities are contained in the *Victorian Year Book*, and, with even greater elaboration, in the *Statistical Register of Victoria*. As information is available there for reference, it is considered sufficient to conclude this paper with a few figures which will show at a glance the great development of local government operations in Victoria during a period of fifty years, and will indicate the principal sources of municipal revenues and the main purposes on which they are expended.

VICTORIAN MUNICIPALITIES.

			1862.	1912.
Number of Municipalities—				
Cities, Towns, and Boroughs ..	..	..	53	61
Shires ..	..	..	84*	147
Population of Victoria .. ..	..	..	554,358 £	1,375,081 £
Annual Value of Rateable Property ..	..	..	3,724,000	15,423,445
Municipal Revenue—				
Cities, Towns, and Boroughs ..	..	..	262,179	1,149,044
Shires ..	..	..	226,833*	796,472
Total .. ..	..	..	489,012	1,945,516
Municipal Expenditure—				
Cities, Towns, and Boroughs ..	..	..	290,111	1,189,568
Shires ..	..	..	198,648*	861,538
Total .. ..	..	..	488,759	2,051,106

* Road Districts.

SOURCES OF MUNICIPAL REVENUE AND HEADS OF MUNICIPAL EXPENDITURE, 1911-12.

Sources of Revenue.	Amount.	Heads of Expenditure.	Amount.
Rates	£ 1,103,210	Salaries, &c. ..	£ 176,489
Government Endowment and Grants	161,513	Sanitary Work, Street Cleaning, &c.	198,006
Equivalent from Licensing Act Fund	80,878	Lighting ..	84,410
Other Licences	21,419	Contributions to Fire Brigades	25,946
Dog Fees	20,438	Public Works—	
Market and Weighbridge Dues	74,029	Construction	335,717
Contributions for Streets, Footpaths, &c.	64,646	Maintenance	736,457
Sanitary Charges	74,058	Formation of Private Streets, &c.	66,735
Rents	81,725	Redemption of Loans	61,782
Other Sources	263,600	Interest on Loans	217,933
Total	1,945,516	Charities	18,441
		Other Expenditure	129,190
		Total	2,051,106

PUBLIC WORKS IN VICTORIA.*By Colonel J. Monash, V.D.***INTRODUCTION.**

Since the first settlement of the territory of the State of Victoria, its people have, in a corporate capacity, expended in works of public utility, through the several agencies which they have created for the purpose, the enormous sum of upwards of one hundred and twenty million pounds sterling, being at the rate of something over £100 per head of the present population. From these totals are excluded expenditure on national defence and on other non-productive enterprises. Extending over a period of effective activity of only some 60 years, such figures arrest attention, and indicate what is the fact, that in a degree exceptional to Australia the creation and the control of the public utilities have remained or have become the business of the State alone.

The agencies by which these functions have been administered are many and various, but they group themselves under four main heads: the first two comprising the respective construction departments of the Commonwealth (operating within the State), and of the State itself; the third including the numerous public corporations which operate with a measure of independence, but under the close administrative supervision of one or other of the State Departments; while the fourth consists of public corporations independent of all but legislative control.

The Home Affairs Department of the Commonwealth has organized a sub-department of works within each State, which concerns itself with the construction of all buildings for the several Commonwealth services, such as Administration, Post, Telegraph, and Telephone Offices, and all non-electrical construction for the latter; also with Defence buildings, comprising Drill Halls, Clothing, Harness, and Cordite Factories, Stables, Ordnance Stores, and Land Fortifications. A branch of this Works

Commonwealth Works. Department is organized for Railway Construction, but no Federal railway works are likely to be undertaken in Victorian territory in the near future.

Federal railway works are likely to be undertaken in Victorian territory in the near future. Works of Naval Defence, which are in their inception, in connexion with the large Naval Base of Western Port, are, however, controlled directly by the Navy Construction Branch of the Department of Defence. In course of time, coastal lighting will be administered wholly by Federal authority, but for the time being it falls within the sphere of responsibility of the State Department of Public Works. During the earlier stages of the development of the Federal Departments, many of the works above referred to were carried out by arrangement, for the Commonwealth, by the State, at the expense of the former.

The three great construction departments of the State of Victoria are the Departments respectively of Railways, Public Works, and Water Supply, each controlled by a Minister responsible to Parliament.

State Works. The internal machinery, however, by means of which these several departments operate varies very widely. Railway works fall into two distinct categories—first, the construction of new railways which is undertaken by a Construction Department directly responsible to the Minister

for Railways, and, secondly, works of maintenance, equipment, rolling-stock, and general operation, as well as works of reconstruction, regrading, duplication, internal extension of existing lines, &c., which are managed by an engineering staff responsible to the Victorian Railways Commissioners, who are created by statute a corporation largely independent of Ministerial control, except in matters of high policy and finance.

The Department of Public Works, on the other hand, has a much simplified organization, resulting from the fact that in its main activities, that of Roads and Bridges, its functions are chiefly supervisory of the exercise of the construction powers delegated to municipal corporations. Nevertheless, this Department does frequently undertake large bridge works of national importance, developmental road works under special votes, and specially important harbor and marine works on a large scale. The Harbors and Rivers Branch of this Department concerns itself particularly with floating plant, dredging, and coastal lighting, in territories outside the jurisdiction of the specially created Harbor Trusts. The Water Supply Department, again, has a still different organization. Its engineering activities are controlled by a Commission of State Rivers and Water Supply, with powers analogous to, and almost as independent as, those of the Railways Commissioners. With the exception of the two great Metropolitan systems of Melbourne and Geelong, whose affairs are in the care of independent Corporations, this Commission controls the whole of the Water Supply and Irrigation Works of the State, the procedure, stated in general terms, being that the Commission, by its own engineering staff, constructs the works of collection and main conservation, while it supervises the local conservation, distribution, and reticulation works delegated to numerous Water Trusts.

The third class of construction authorities has already been indicated. It consists of the Municipalities (comprising cities, towns, boroughs, and shires) whose chief concerns are roads and bridges, and of Water Trusts—both urban and rural—who, drawing their authority from the Water Supply

Municipal Works. Commission, undertake works of local distribution, or, in cases where the supply scheme is small in extent, the scheme as a whole. The funds for all works carried out by such local authorities are provided partly by local rating, or from loans secured on the local rating, and partly by Government subsidy. Wherever Government subsidy is involved, the supervision of the State Department concerned is close and searching, extending to a minute scrutiny of the engineering details of all works.

There remain to be enumerated lastly the independent corporations erected by statute, with quite independent borrowing powers, and subject only to indirect supervision by legislative means. In this class we find the Cities of Melbourne and Geelong, which proudly boast that they stand wholly outside of the operation of the Local Government Act, the Harbor Trusts of the Ports of Melbourne and Geelong, the Melbourne and Metropolitan Board of Works—which is concerned with the water supply and sewerage of the Metropolis—and the Geelong Water Supply and Sewerage Trust, which exercises similar functions in the

Other Public Works. Geelong area. The underlying principle is that these corporations are supreme within prescribed territories and as regards prescribed functions, and the



EXHIBITION BUILDING, MELBOURNE.

public works carried out by them are paid for from loans raised upon the security of revenues, and administered under delegated legislative powers in the form of by-laws, which require in most cases the concurrence of the Governor in Council.

From this brief and necessarily inadequate enumeration of the many agencies by which different classes of public works are brought into being in the State of Victoria, it must be apparent that the quality of performance and the degree of efficiency achieved must vary considerably, that there

Diversity of Method. results a great diversity of method, that there is little in the nature of a general standardization of engineering practice, and that there is a certain amount of overlapping and misdirected effort. These features must, however, be regarded as inevitable in a social organization which has committed itself whole-heartedly to the principle of public ownership of all general utilities, and to the devolution of matters of local concern to local authority, and which finds itself still in the stage of development in the realization of these principles.

Just as their organization and administrative methods differ, so also do the status and efficiency of the engineering staffs vary widely. At one end of the scale we have the State Departments of long standing, which have gathered together highly efficient engineering staffs, and have trained them on the lines of settled and traditional construction policies, with due regard to experiment and research as the science of construction has developed. At the other end of the scale we find the relatively lower professional efficiency incidental to, and inevitable from, a policy which may be described as over-decentralization, as in the case of the several hundred small local governing bodies, whose professional advisers have perforce to operate quite independently and without any very effective central control in the direction of a proper standardization of method, or the creation of a uniform code of practice. While great and successful works of engineering construction stand to the credit of the profession as a whole, it cannot be claimed that the level of professional efficiency is uniformly high, largely because of the absence of any definitely accepted standard for admission into its ranks. It is true that certain statutes require that engineers in the service of local bodies must acquire legal qualifications, but the standards for such qualifications cannot be regarded as satisfactory in view of the great modern development of new forms of construction and the rapidly growing need for wider training in kindred sciences. It is only in comparatively recent years that the influence of the Melbourne University has made itself felt in this connexion ; only in rare cases in former years had engineering graduates been fortunate enough to achieve positions of eminence in the engineering staffs of the public departments. But the distrust of academic training is gradually disappearing, and, with the resultant increasing absorption into the public services of men trained in a well-balanced and comprehensive University curriculum, an era of more scientific, and, what is of equal importance, of more uniform, engineering construction may be confidently hoped for.

An interesting aspect of the development of public works in a young community is the gradual, though slow, transition from a policy of lowest first cost to one of lowest ultimate cost. In territories at first sparsely settled, and with no certainty of permanent occupation, there is much to commend the

policy of serving the immediate public need at the lowest original capital expenditure, quite regardless of the quality of the work as to its durability, or

Change in Policy. of the increase of population as to its expansibility. But, with the growth of population, and the assurance of the permanent settlement of districts, comes the inevitable change of view in favour of reconstruction in durable methods with non-perishable materials, and of the recognition of the fact that the reduction of annual maintenance charges is at least as important as economy in first cost. Thus the present era is witnessing the transition, in all the more densely populated districts of the State, from wooden to steel and concrete bridges and culverts, from indifferently macadamized to modern asphalt paved streets, from primitive wooden to commodious brick, concrete, or stone railway and other public buildings, from pumping to gravitation schemes of water supply, and from heavy to easy gradients in railway and road location.

A factor which has precipitated, in many branches of engineering construction, the adoption of non-perishable building materials, has been the depletion of the once magnificent timber resources of the State. The Victorian hardwoods (eucalypts) vary considerably in value to the engineer, depending upon botanical character, locality of growth, and method of preparation for market. The best timbers and their best manipulation were speedily recognised in the early days, and, without thought of the future, an onslaught was made upon our forests, which were denuded in wholesale fashion without any real attempt to conserve the interests of succeeding generations. The result to-day is that "redgum," so valuable for its well-known quality of endurance when buried underground, has in suitable sizes for construction purposes almost entirely disappeared from the market, and that box and ironbark, tough, dense, and regular in grain, so suitable for piles and bridge beams, have doubled in cost, so that the engineer is to-day relegated to the use of relatively inferior and less durable timbers with a life of less than twenty years. The realization of the futility of burdening posterity with the capital cost of public works, which have a life of one generation only, is to-day acting as a powerful stimulus towards the general adoption of permanent materials and methods with a consequential general improvement of standard.

RAILWAYS.

Railway construction began in Victoria as a private enterprise, but such private construction was limited in extent, and ultimately became absorbed in the State systems. Prior to 1880 a number of attempts to launch private railway undertakings, conceived with a view to decentralization of trade and its distribution to harbors other than Port Phillip, met with legislative extinction, largely owing to strong opposition by metropolitan vested

Growth of System. interests. The result of such a policy, accentuated by State ownership, has been a complete concentration of transportation facilities towards the capital—a result aided by discriminating freight rates which have effectually stifled the development of a coastal shipping trade on anything like substantial lines. The lines first constructed by private means were from Flinders-street, Melbourne, to Port Melbourne—a distance of about 2 miles—first opened in September, 1854; from Geelong to Melbourne, and from Melbourne to Essendon. By 1880 all these lines

had been taken over by the State, and at the present day the whole Railway system of Victoria is under the control of the Railways Commissioners, with the exception of one short 14-mile section of line from Kerang to Koondrook, which is owned and operated by a municipality.

From small beginnings the Railways of the State have grown to the respectable total of 4,700 miles in the equivalent of single track, comprising 5-ft. 3-in. gauge main lines and sidings, with about 130 miles of 2-ft. 6-in. gauge feeders in several mountainous districts. The diversity of Australian railway gauges is a scandal, of which Australia is justly ashamed, and a difficulty which is acute, and still awaits a statesmanlike solution.

The question has been again raised, and much accentuated

Gauges. by the necessity for arriving at a determination of the gauge to be adopted for the Transcontinental Railway from Port Augusta (S.A.) to Kalgoorlie (W.A.). The decision, as it stands, is to adopt the 4-ft. 8½-in., or so-called "standard" gauge, which differs from the gauges at present in use at both its terminals, these being 5 ft. 3 in. at the eastern and 3 ft. 6 in. at the western end. A body of weighty, though not official, opinion upholds the view that the 5-ft. 3-in. main line gauge of Victoria and South Australia ought to have been adopted, as a first step towards the general conversion of all Australian lines to that gauge. As the question now stands, it is inevitable that the whole of the permanent way and rolling-stock, both of Victoria and South Australia, will have to be converted to the 4-ft. 8½-in. gauge to fall into line with the gauges of New South Wales and the Transcontinental Railway.

The early history of this unfortunate diversity of gauges is shrouded in uncertainty, but the oldest of Victorian railway engineers still proclaim that Victoria was blameless in the ancient dispute which led to a divergence of practice between Victoria and New South Wales. In those days few men were far sighted enough to contemplate the possibility that the respective State capitals would ever be linked up by railway facilities, and so the adoption of diverse gauges was entered upon and persisted in until its evil consequences have become one of the engineering and financial questions of first magnitude yet awaiting solution.

While the railways of Victoria have operated most beneficially in the rapid development of the territories of the State and in the establishment of a large, varied, and widespread production in the form of agriculture, pasture, dairying, mining, and manufactures, conversely these activities now

Extent of Operations. provide considerable scope for the economic and scientific operation of the railway system. Some idea may be gleaned of the extent of this branch of State activity by contemplating the figures involved, which are given for the year 1913. The gross revenue was £5,222,000, and the working expenses £3,605,000, or about 69·03 per cent. of revenue. The train mileage was 14,648,000. The railways carried during the year about 113,430,000 passengers, and about 5,150,000 tons of goods and live stock.

The total capital expenditure on the railway system approximates to date some £18,000,000 sterling. Thus it will be seen that even if, which is by no means the case, the whole of this sum represented borrowed money, the margin between revenue and operating cost was sufficient last year to yield

a return of about 3·37 per cent. Taking the average of the last five years the return was nearly 4 per cent. The policy of the Railway Administration is, of course, to operate so as to just pay its way, and to regulate freights and fares so as to cover working expenses and a fair rate of interest on capital. The freights and fares are generally acknowledged to be fair, moderate, and judicious, despite the fact that wages, at least to all permanent employés, are on a much higher scale than is customary on English and Continental privately-owned railways.

The special feature of the Victorian Railways is the Metropolitan suburban traffic. By reason of a skilful lay out on a radial system, the suburban railways have succeeded, until very recent times, in serving all the needs of the metropolitan population for passenger transportation. The service on most lines is rapid and frequent, and it is only in more

**Metropolitan
Suburban
Traffic.** recent years that street tramway transportation has become a serious competitor, leading to a demand for a complete conversion of the suburban system to electric traction.

Such a conversion, the initial steps towards which have already been taken, will doubtless still further increase the popularity of the system, which is already considerable. For example, the staff at Flinders-street Station, one of the city terminals, handles daily some 180,000 passengers, exclusive of transfers, while in busy times, such as on the occasion of the visit of the United States battle fleet, the daily traffic dealt with at this station has risen to 365,000 passengers.

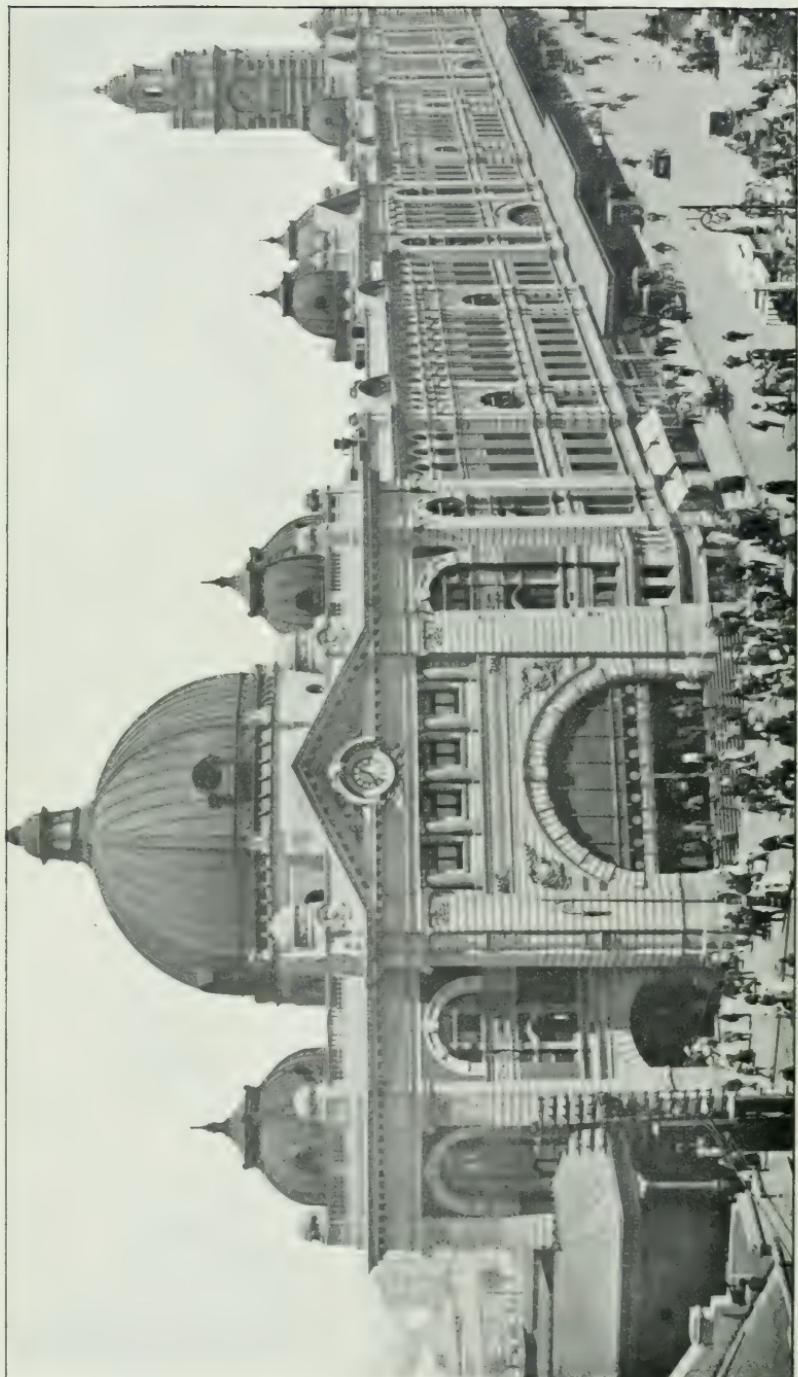
The fares on the suburban system are based upon a sliding scale of 1d. per mile from 1 to 5 miles (with a minimum of 2d.), and thereafter to the

Fares. 10th mile $\frac{3}{4}$ d. for first class; the rates for second class being $\frac{3}{4}$ d. from 1 to 5 miles (with a minimum of 1d.), thence to the 10th mile $\frac{5}{6}$ d. These are the charges for single journeys, return fares being calculated upon the basis of one and one-half single fares. The fares for distant country journeys are calculated on analogous lines.

To handle this very large traffic, the Railway Department possessed, in commission, the following rolling-stock in 1913, viz.:—668 locomotives, 2,075 coaches, and 15,868 trucks. A large proportion of this plant has been constructed in Victoria, principally in the Department's

Rolling-stock. own workshops. Only occasionally, and at times of pressure, are contracts for locomotives and trucks let to private firms, and even under these circumstances the Department provides the vital parts. Quite recently, owing to the great and sudden increase in requirements due to bountiful seasons and great productivity, has it been found necessary to place orders abroad for locomotives.

The workshops, which cater for the rolling-stock requirements of the Department, and which are also responsible for all work of repair and upkeep, are situated at Newport, have cost for their establishment some £475,000, and regularly employ about 4,000 hands. These workshops have a fine equipment of up-to-date machine tools and forges, and, with the exception of wheels and axles, the whole construction work of every kind is carried out there. Visitors, in their journeyings through Victoria, will be enabled to judge of the excellence of the design and workmanship of both locomotives and coaches turned out by this workshop.



CENTRAL RAILWAY STATION, FLINDERS STREET, MELBOURNE.

From a considerable number of differing types of locomotives, the departmental engineers have been able to evolve a few standard types respectively for fast passenger, heavy freight, suburban, and station-yard services, and both in fuel economy, tractive force, balancing, and durability a high degree of efficiency has been achieved. Similarly, as regards passenger coaches, there has been a progressive improvement both in comfort and workmanship,

and the evolution of types most suitable for local conditions.

Locomotives and Coaches. The principal main line coaches are up-to-date vestibule corridor cars, 71 feet by 9 ft. 6 in. over all, strongly built on steel underframes. The country lines are also served with parlour, observation, sleeping, and dining cars, which, compared with best European and American standards, leave little to be desired. In the suburban system there has recently been introduced a new type, known as the "Tait" car, specially designed for rapid entry and exit, having *sliding* doors to each compartment, with a central passage-way. The cars are 60 feet long, and have been a pronounced success, soon becoming very popular.

The train illumination is now carried out throughout Victoria, uniformly, with Pintsch gas and incandescent burners; while the Westinghouse brake is fitted to all trains.

Coal Consumption. The coal consumption of the whole system amounts to 490,000 tons per year, more than half of the quantity being supplied from the Victorian State Coal Mine at Wonthaggi, while the balance is imported from New South Wales.

Speed. The speed standards for the 5-ft. 3-in. gauge lines are 60 miles per hour maximum on country lines, and 40 miles per hour maximum for the suburban lines; while on the 2-ft. 6-in. gauge the maximum speed is 20 miles per hour.

Turning to the engineering construction of the railways, this is characterized by a close adherence to conservative and orthodox railway practice. The permanent way has 100-lb. rails on suburban, and 80-lb. rails on main country lines with 60-lb. rails on the less important branch lines. The

Engineering Construction. ruling gradients are on main lines 1 in 50, and on branch lines 1 in 40, and the minimum curves are respectively 12 and 9 chains radius. There have been comparatively few difficulties, and still fewer blunders in location and construction, the tunnels are few, and not of great importance, and the works of regrading have not been extensive. Several large bridges and viaducts have outlived their usefulness, and are being gradually replaced to meet the considerable increase in axle loads through the adoption of more modern types of engines.

The project of the electrification of the suburban system has been alluded to. This is now in progress, and involves the erection at Newport of a central power station, where electricity will be generated at 20,000 volts, three-phase, 25 cycles, being thence transmitted to twelve sub-stations,

Electrification. where the current will be transformed down to 1,500 volts, direct current, by means of rotary converters, at which pressure it will be supplied to overhead lines along the tracks. The conversion to electricity as the tractive agent is expected to lead to a great improvement of the service of transportation both in speed and frequency of trains, minimizing the ugly congestion of traffic which often occurs during the busy hours.

The expansion of the Metropolis by concentration on lines defined by the radial arrangement of the suburban system is operating year by year to increase the congestion of traffic on several of the more **Quadruplication of Lines.** popular routes, so that it is a matter of only a very little time when the question of quadruplication of some of the lines (at present duplicated), so as to provide separately for express and local traffic, will have to be seriously considered.

ROADS AND BRIDGES.

The responsibility for the location, construction, and maintenance of streets and roads has rested for many years chiefly on local government authority. In early times there was a system of tolls, which provided a revenue that went to provide for efficient maintenance. But, following European precedent, all barriers to the free user of the highways were swept away many years ago, and each municipality became responsible for the roads within its own territory. The results of this

Policy hitherto adopted. policy provide evidences of the extremes of efficiency and the reverse. Wealthy city corporations have been enabled to give expression to the latest thought in road engineering, while the more outlying, extensive, sparsely populated and indigent shires have found their resources altogether inadequate for the merest semblance of usable roads. In the last ten years has come the clamour for mechanical transport, and it has found the municipalities responsible utterly unable to respond.

For many years past the Government of the day has doled out small subsidies to the poorer shires to help in the work of creating some kind of road, but the broad result to-day is that, always excepting the streets within city and town limits, and a few main roads in specially easy and favoured districts, there are few of the thousands of miles of so-called roads all over the State which can be described as efficiently serviceable for ordinary industrial purposes. While some part of this evil is doubtless due to errors in location on the part of the earlier land surveyors, lack of funds to carry out proper grading or drainage or the laying down of a stable road bed chiefly contribute to the result that there are very few first class roads yet available to the Victorian public. Very many "roads" are wholly unformed; more still are formed but unmetalled; and there has been in the past a serious lack of what may be described as the strategic location of main transverse arteries of traffic to provide for cross communication between contiguous industrial or producing areas.

The advent in ever increasing numbers of motor vehicles has accentuated the bad condition of most of our roads, and is one of the factors which has precipitated a wise and beneficent governmental action in the creation by statute of a Country Main Roads Board, with extensive responsibilities and powers. This Board will be placed in control of a sum of £4,000,000, raised one-half by Government loan and one-half by local rating, which is to be expended in the next five or six years in the construction and maintenance of main roads. The Board has power to declare any existing road a "main road," to create new main roads, to levy rates accordingly, and to inaugurate a system of first-class road construction. Owing to the dispersion of effort in the past,

Country Roads Board.

little has hitherto been possible in the direction of the installation of modern road-making machinery, or of embarking upon comprehensive quarrying, breaking and distribution of suitable road-making material, which fortunately exists within easy reach all over the districts where the need for good roads is most acute. The Roads Board contemplates operations on a scale which will permit of considerable economies, and will also aim at a standardization of engineering practice which can only be beneficial.

In the country roads of the past, excluding the many cases where either lack of funds or of experience has prevented the employment of any orthodox methods, the favorite mode of construction has been Macadam from 6 inches to 9 inches thick, of basaltic or metamorphic stone broken to 2-in. or $2\frac{1}{2}$ -in. gauge, blinded with sand or loam, making a very fair road surface, but one liable to rapid deterioration in a wet environment. The employment of

Telford sub-bed has been rare. In city streets the bulk of the construction is Macadam or "Tar Mac.," only the more pretentious main city streets of Melbourne and its more affluent

suburbs being treated with wood blocking on a cement concrete bed. Certain Victorian hardwoods have proved eminently suitable for this purpose after being cut into blocks and soaked in coal tar. Such streets are hygienic, very quiet, and durable, especially when treated annually with a dressing of distilled coal tar and sand. There are very few and only very restricted examples of the experimental employment of natural asphaltum or of concrete in city street construction, while the use of asphaltic concrete is still unknown in this State.

In connexion with roads are to be considered bridges and culverts. Only a few districts of the early days adopted construction in brick or stone arches, or abutments, with iron or steel superstructure; and the great majority of municipal structures have been of hardwood timber of very varying quality and durability. While constantly confronted with fresh requirements in the way of new bridges and culverts, by a steadily increasing population,

Bridges and Culverts. most municipalities are now faced with the great burden of the reinstatement of old timber structures, of ages varying from 25 to 40 years, which have fallen into dangerous decay. Fortunately, the difficulties of the situation have been greatly relieved by the advent of reinforced concrete, as a means of construction eminently suited for the purpose, of quite indefinite life, and of a first cost little greater than timber construction at the present market prices of reliable timbers. Already many hundreds of bridges and culverts of reinforced concrete have been constructed all over the State, including several ambitious and ornate structures over some of the larger rivers. The immunity from depreciation and heavy maintenance charges is already having its effect upon municipal finances.

Some idea of the extent to which local government has been developed may be gleaned from the fact that there are in Victoria 208 municipalities, having rating powers upon an annual real property value of **Extent of Local Government.** about £15,400,000. These municipalities spend annually about £1,000,000 in construction and maintenance, the greater portion of which sum is devoted to roads and bridges.

WATER SUPPLY AND SEWERAGE.

As nearly one-half of the population of the State is localized in the Melbourne district, it will be understood that the water supply system of the Metropolis greatly exceeds in magnitude, importance, and complexity all the other similar works of the State. Until 1891 the Melbourne system was under the control of the Water Supply Department, but it was in that year handed over to a newly created corporation, the

Melbourne Water Supply. Melbourne and Metropolitan Board of Works, which body was also charged with the task of introducing a comprehensive system of water-carriage sewerage. Under its control the water supply system, already copious, efficient, and prosperous, has, during the past 22 years, been greatly expanded and improved, and it stands to-day for plenitude, reliability, and purity of supply in an almost unrivalled position. This Board has spent (inclusive of the capital cost of the works taken over from Government) nearly £5,000,000 on water supply and £7,000,000 on sewerage, and both systems have now almost reached the full development necessary to meet the utmost demands of the present population. Moreover, the reservations of forest lands in the mountains to the north and east of the city have been on such a generous scale, and the ascertained further sources of supply are so considerable, that no serious thought will need to be given to any curtailment of the present very liberal allowance of over 100 gallons per head per day for a generation or two to come, if the present rate of increase of population be maintained.

The system comprises at present three main sources of supply—the Yan Yean Storage Reservoir, capacity 6,400 million gallons, which is fed by aqueducts tapping the Silvery and Wallaby Creeks flowing from Mount Disappointment, some 30 miles due north of Melbourne; the Maroondah River (a tributary of the Yarra), at a point about 35 miles east of the city; and the O'Shanassy Creek, another tributary, still further east. From

Sources of Supply. these several sources, the water is led, wholly by gravitation, to a series of sedimentation and service reservoirs at Preston to the north, and Surrey Hills to the east, of the city, from which points the reticulation system is taken. The normal minimum supply is at present upwards of 65,000,000 gallons per diem, but this quantity is capable of very considerable expansion by a further storage reservoir in the Maroondah basin and the duplication of the Maroondah and O'Shanassy conduits, without any call upon further known sources of supply within the reserved areas. The water supply is on such a generous scale that potable water is permitted to be freely used in street and garden watering, being sold by meter at 1s. per 1,000 gallons to ratepayers.

The sewerage system is water carriage by gravitation to a pumping station on the River Yarra at Spotswood, where, after a pumping lift of about

Melbourne Sewerage System. 80 feet, it is taken by a main outfall aqueduct to the Werribee Sewage Farm, and there profitably and inoffensively disposed of. The system of main and branch sewers

over the area under the jurisdiction of the Board is now practically complete, and only a small percentage of the house connexion work still remains to be done. The results of the introduction of the system in the reduction of zymotic diseases have been markedly successful.

The City of Geelong is, step by step, following the example of Melbourne, possessing since 1910 a Water and Sewerage Board with independent powers, which took over the existing Stony Creek Water Supply, and **Geelong.** inaugurated a scheme of sewerage, with ocean outfall, near Barwon Heads. These works are now in their more initial stages.

The water supply of other provincial centres and rural districts, as well as the main works of conservation and distribution for irrigation purposes, are still under the control of the Government, being vested in the State Rivers and Water Supply Commission, which is responsible to the Minister of Water Supply. Under its charter, this Commission absorbs the whole of the water rights of the State, and thus the rights of riparian

Other Districts. proprietors to the use and flow of the streams entirely disappear. No conservation or diversion may any longer take place, except under special licence. The activities of this Commission in the direction of water supply for irrigation purposes are dealt with comprehensively in the chapter on Irrigation, so that reference need here be made only to water supply for domestic and industrial purposes. These fall into two groups, classed respectively as National and Municipal.

Of the national works, the largest are the Gong Gong system for the supply of Ballarat; the Coliban and Malmsbury system, for the supply of Castlemaine and Bendigo; and the Nagambie system, which, in addition to supplying certain towns in the Goulburn Valley, includes the head works of a great irrigation system. The main conservations are carried out on quite orthodox lines, with the usual earthen embankments with flat slopes and

National Works. a clay or concrete core, lower slope grassed, upper slope beached, or with masonry or concrete gravity dams of moderate height. The experiences with such dams and embankments have been, upon the whole, satisfactory, none giving serious trouble from leakage or foundation difficulties. The distribution works consist of open channels, stone or concrete lined, and of piping. In earlier days, the use of cast iron was universal, but latterly steel pipes, both spiral riveted, spiral welded, and of the locking-bar type have grown in favour. Steel piping, when properly protected by pitch and tar coating, carefully applied, has given every indication of a satisfactory life. Reinforced concrete is being gradually introduced in short lengths for relatively low heads, while wood-stave piping has also been applied experimentally.

Apart from these greater works, there exists a very large number of minor urban and rural systems, both gravitation and pumping, which serve populations of from 500 to 5,000, and are based on a local **Minor Systems.** rating varying from 1s. to 2s. in the £1 on annual rateable values. The installation of such schemes is ever on the increase, and the sources of supply are in general pure and satisfactory.

Apart from the Upper Yarra Valley, upon which rests the principal responsibility for the supply of potable water for the future expansion of the Metropolis, the other great Victorian source of supply is the Goulburn River, the largest and most bounteous of the Victorian tributaries of the Murray, which is fed by numerous mountain streams that take their rise in the northern slopes of the great Dividing Range, and receive accretions from an extensive

area of winter snows. It is a reproach to engineering enterprise that no utilization has yet been made of the greater portion of this splendid annual supply of water. From the time the thaw commences, about the end of August, until well into the summer, the Goulburn runs a banker, often in high flood, and most of this precious water has been allowed to flow into the Murray, and thence to the ocean. Schemes are, however, now under consideration for large storage works in the upper reaches of the Goulburn, to operate both for conservation for irrigation purposes and in mitigation of floods.

The loan liability of the State for water supply works amounts to about £8,000,000. Of this sum about one-sixth is for free head-works, while for the payment of interest on the balance the districts and populations benefited are liable.

Associated with the question of water supply and irrigation is the great outstanding question of the canalization of the River Murray from a point at about the meridian of Melbourne to its mouth—a question whose financial solution and realization will on the one hand make available vast additional

Canalization of River Murray. water for irrigation and intense culture, and on the other hand provide a new avenue of cheap carriage by water to the sea.

This question is, however, one affecting the three States of New South Wales, Victoria, and South Australia, whose interests are not, or are thought not, to be identical; and numerous conferences, both scientific and political, conceived with the object of framing a common policy and line of action, have, so far, proved abortive.

HARBOR WORKS.

Victoria possesses only the one great natural harbor of Port Phillip, and the policy of the concentration of all ocean trade in the Metropolis has discouraged any attempts to seriously develop and improve the few other outer harbors. Those worthy of mention outside Port Phillip are the

Harbors. harbors of Portland, Port Fairy, Warrnambool, and Westernport. At all these points there has been considerable expenditure on wharfs, jetties, and landing facilities, and in some cases on breakwater construction, but neither the depth of draught provided, nor the equipment for handling merchandise, has been on a scale to serve more than a modest coastal trade. The harbor of Port Phillip, however, has both justified and benefited by considerable works.

A troublesome, tedious, and costly work has been the progressive deepening of the entry to the harbor at Port Phillip Heads, as the gradual increase in the draught of ships has made the negotiation of this difficult entrance more and more hazardous. A rocky ledge, extending completely across the

Deepening Entrance to Port Phillip Bay. entrance, has had to be cut away for a width of 1,000 feet, first to 30 feet, and later to 35 feet, and now the deepening to 40 feet at low water is under way. The limitations of the Suez Canal operated for many years to delay this important work, but the gradual adoption of the Cape of Good Hope route for vessels of large draught and tonnage, and the imminence of the Panama Canal trade have precipitated a work by means of which alone the ocean trade into this harbor can be preserved.

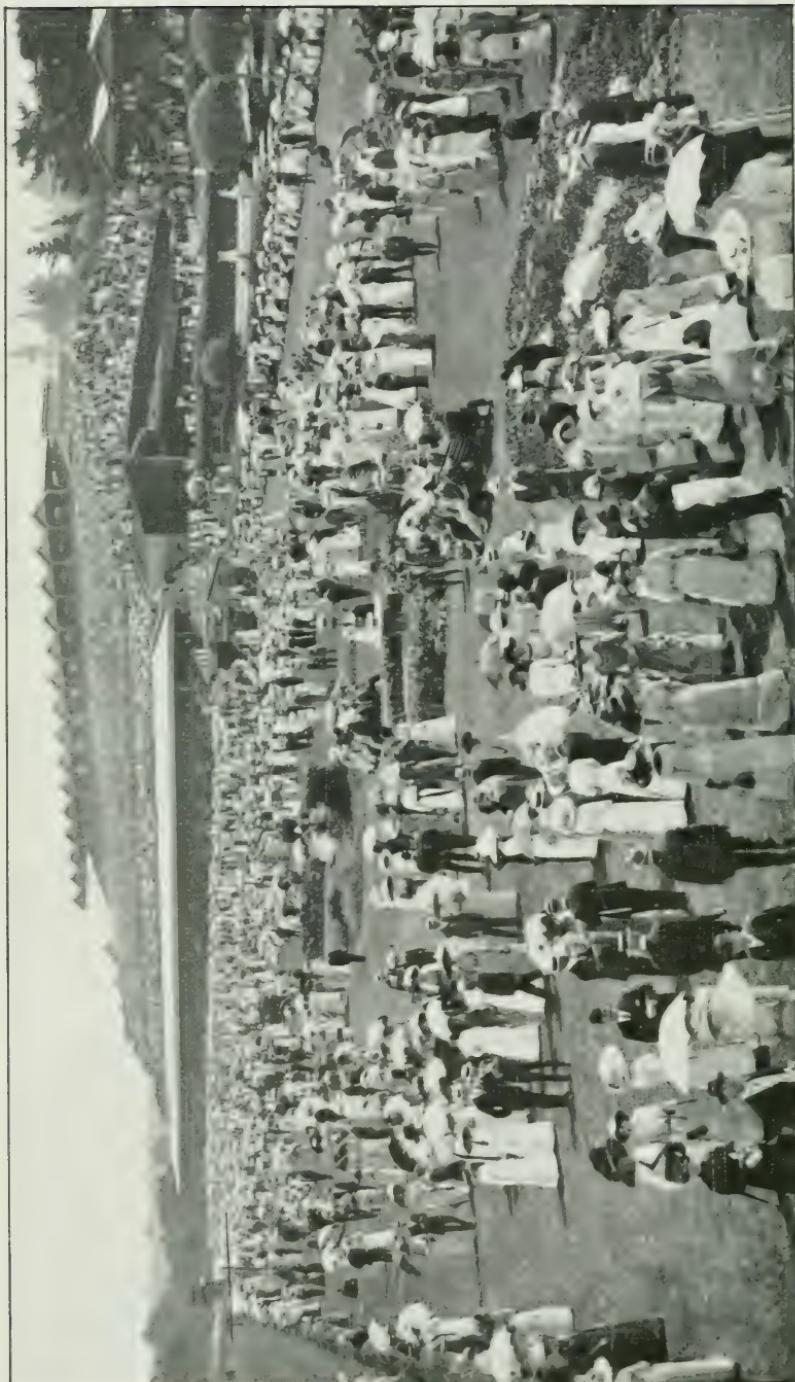
Within Port Phillip, the two bays, named respectively Corio Bay and Hobson's Bay, mark the spheres of jurisdiction of the Harbor Trusts of Geelong and Melbourne. The former, having been but recently constituted, represents the first serious attempt to decentralize from Melbourne the trade of the great and wealthy Western District. The harbor works of Geelong are still in their initial stages, consisting chiefly of dredging and pier construction.

**Works at
Melbourne and
Geelong.** The Melbourne Harbor Trust has, however, since 1876, carried out very extensive works, of which those associated with the navigability of the River Yarra have been

the most important. From a point near the heart of the city to its mouth, the river has been rectified, trained, and deepened so as to secure a natural scour, and has been equipped with about 6 miles of wharfs, transit sheds, landing machinery, water supply, and swinging basins. The large Victoria dock debouches from the river immediately to the west of the city, and has an area of nearly 100 acres, with a depth of 26 feet at low water. The Trust is also responsible for considerable works in the Bay, including large timber piers at Port Melbourne and Williamstown. The revenues of the Trust from harbor dues and landing charges amount to about £350,000 per annum. While much has been done in the direction of improving natural facilities, it is recognised that much effort and expenditure are still necessary to bring our harbor facilities into line with modern requirements. The total shipping of the Ports of Melbourne and Geelong now exceeds 7,000,000 tons per annum, being about one-third of that of the Port of London.

OTHER PUBLIC WORKS.

The activity of the State has entered other domains. A small section of electric street tramway is owned and operated by the Railways Commissioners. The State also possesses a coal mine at Wonthaggi, chiefly for the supply of the railways; while its operations in the construction of buildings for education and administration have been extensive. All public works in connexion with posts, telegraphs, and telephones, coastal lighting, defence, and Customs within Victorian territory, have now been removed from State to Federal jurisdiction, and do not therefore find a place in what is intended as a brief *r  sum  * of the scope, character, and mode of creation of the public works for which the State of Victoria is responsible at the present day.



THE LAWS, FLEMINGTON.

THE VICTORIAN LABOUR LAWS.

By H. M. Murphy, Chief Inspector of Factories.

The earliest attempt at regulating the conditions of labour in Victoria was made by the passing of an Act dated the 11th November, 1873, forbidding the employment of any female for more than eight hours in any day in factories. The same Act defined "factory" to be a place where not less than ten persons were working.

This small provision was administered by the Board of Public Health, and was followed, in 1885, by a much larger statute, providing for the registration of factories, their sanitation, fire escape, guarding of machinery, and regulating the conditions of work generally to a much greater extent, besides providing for the closing of shops at fixed hours. These latter provisions were designed to give some relief to the employés, who could previously be kept at work in shops as long as their employers chose.

From that time onwards, further legislative provisions have been passed at frequent intervals, and gradually the community has come to recognize the necessity of securing the health, comfort, and reasonable ease of the workers. The opposition, which was at first very strong, has gradually disappeared, until now it is safe to say that all sections of the community realize the humanitarian aspects of the movement, and have accepted the principle that the rights of work-people shall be conserved by law.

To-day the factory worker is better looked after as to his wages, personal safety, health, and moral surroundings in Victoria than in any other part of the world. The Government inspectors prosecute employers wherever underpayment is found. They take proceedings also to carry out all the provisions of the factories laws. No one can occupy a factory unless the place is properly lighted, ventilated, has ample means of escape in case of fire, has all its machinery fenced and guarded, and has proper sanitary arrangements provided for both sexes.

The closing of shops has been carefully regulated, so that all shops, with a few exceptions, such as chemists' shops or shops where food is sold, and which require to be open almost continuously, close at the hour of six in the cities and seven in the country on four days of the week, with a later closing hour (ten p.m.) on Friday, and a half-holiday from one p.m. on Saturday. This half-holiday is just about to become general throughout the whole State, and is in itself a boon of enormous value.

The Wages Board system of fixing wages and settling the conditions of employment had its origin in Victoria. It was introduced into an Act of Parliament by Sir Alexander Peacock, the present Minister of Labour, in 1895, and the idea, it is said, was suggested to him when **Wages Boards.** a dispute as to wages occurred between miners and mine-owners in his constituency. The employers and the miners met together, and, sitting upon a heap of mullock at the mine, discussed the aspects of their dispute, and, as a result came to an understanding which enabled work to be immediately resumed.

The Minister at that time had probably no idea of the merit of his discovery, nor could he have had any foresight of the extent of its application in the near future. It has now come to be regarded pretty generally as the most nearly perfect system of fixing fair wages and conditions that has yet been devised.

The principle embodied in the British jury system that a man can only be tried by his peers is the essence of the Victorian Wages Board scheme. The Boards are composed of equal numbers of employers and employés, usually either three or five from each side. The representatives are carefully chosen, so that every shade of interest in the trade shall be represented as fully as possible on the Board. The Board thus becomes a jury of trade experts, all of whom are versed in the requirements and intricacies of the trade they are dealing with.

At their first meeting the members appoint a neutral Chairman, whose duty it is to conduct the proceedings, and who only votes when the parties are equally divided. The Board has the widest field of selection, and can appoint whomsoever it chooses. Experience shows that the men who most frequently make good Chairmen are the Police Magistrates; but there are many most excellent Chairmen who have never had any experience of conducting a court. As a rule, the Chairman knows little or nothing about the trade being dealt with, and it is better that it should be so, in order that he may come to the meetings with an open mind, and be uninfluenced by the interests of either employers or workers.

The members of the Board meet on equal terms, and discuss with the utmost freedom the whole of the aspects of the matter they are dealing with. It was at first thought that employés would be at a disadvantage in the presence of employers; experience shows that this is not so, but that they express their ideas and put their arguments with the greatest confidence. In most cases it is found that the employés are quite as competent to put their case in its best light as are the employers. Not infrequently the honours of the debate are distinctly with the men. Where the representatives of the employés are women, an exception must be made. They have in some cases been found quite unequal to the task of properly enforcing their just rights in face of their employers.

An application for a Board in any trade which has not been brought under the Wages Board system can be made either by a Union or a meeting of employés. Upon receipt of such an application the Minister usually orders the collection of figures to show the rates of wages, the average number of hours worked, the number of persons employed in the trade, and so on. If he finds that there is good reason, he introduces into Parliament a Resolution which invariably is passed, and a Wages Board is formed.

The Wages Board, having been constituted, meets as often as it chooses, usually once a week, at the Factories Office. An officer of the Factories Department acts as secretary. The members of the Board are paid 10s. a sitting, with the addition of necessary out-of-pocket expenses. The Chairman receives £1 per sitting. A complete Determination is usually reached in about three months' time. Although it is true that some Boards have taken nearly two years, it is also true that others have taken much less than three months over this work. The Slaters and Tilers Board took only three

meetings to make a Determination, the Factory Engine-drivers Board five meetings, the Country Shop Assistants Board six meetings, the Brewers Board seven meetings, the Boot Dealers Board eight meetings, the Quarry Board eight meetings, and the Country Saddlery Board nine meetings.

The Determination having been completed by the Board, it is sent to the Minister of Labour and gazetted, and thereupon becomes law. It is then the duty of the officers of the Factories Department to enforce it. Inspectors visit all places where persons are employed under it, and report cases of underpayment. Where the Minister considers that the breach of the law is trivial, or has occurred through a mistake, he administers a warning; in more serious cases he orders a prosecution. The prosecutions are carried out by the officers of the Factories Department, without expense to the worker. The Victorian system is different from many others in this respect. In other States, officers of the Trades Unions are empowered to prosecute for breaches of the law. This is not so in Victoria. All prosecutions are conducted by the State, but it is open to any worker who chooses to do so to sue in a civil court for wages due to him.

A cardinal principle of the Victorian law is that Trades Unions are neither recognised nor ignored. A body of 1,000 men will receive the same treatment whether they have formed themselves into a Union or not. As a matter of fact, most trades have formed Unions, and the State Department deals with them as representing the number of units which correspond to the number of their members.

Another cardinal principle is that the Victorian system takes no cognizance whatever of strikes. The system provides the fullest means to the workers of assuring themselves a fair living wage. It furthermore provides that conditions can be adjusted as occasion arises at any time without any expense to the worker. In that connexion a Wages Board meets whenever required—and, whenever the evidence shows the necessity therefor, alters its Determination to suit the need of the moment. It will be seen, therefore, that under the Victorian system there is no justification for a strike and no need for it. Having provided all these means for making strikes unnecessary, the Victorian system is inoperative if the workers should have recourse to a strike. This is in direct contrast to the systems in some of the other Australian States, more particularly to that in New South Wales, where laws have been passed and officers appointed with the special object of settling disputes. It is claimed that the Victorian method has had the result of preventing strikes.

A Quarterly Report of the Commonwealth Statistician recently issued points out that, out of 49 strikes in Australia, for a period of three months just passed, 35 were in New South Wales. It is therefore difficult to escape the conclusion that the existence of means for settling strikes after they occur has in some cases the effect of encouraging them.

A point of special merit in the Victorian system is that Wages Boards cost nothing to either employer or employé. A comparison with other States shows also that this is one of the most economical systems, if not the most economical one in Australia.

The Factories and Shops law contains the most elastic provisions for enabling the Minister to deal with Boards, by grouping them under one Board or dividing them into two or more, as experience of their operation shows to be desirable. He can decide the localities over which each Board's Determination shall run. In some cases a Determination covers the whole State, in others cities and towns, and in others again country districts only.

The number of Wages Boards either formed or in process of formation in Victoria is 135. The number of workers affected or to be affected by these Boards is approximately 155,000.

The total increase in wages paid to workers in Victoria, under Wages Boards Determinations, over and above what would have been received by them if their original wages (paid before the respective Determinations) had remained unaltered was as follows :—

At the end of 1909	..	..	..	£3,446,000
.. 1910	..	..	..	4,447,000
.. 1911	..	..	..	6,296,000
On 1st March, 1913	..	..	..	10,000,000

The cost of administration of labour laws in Victoria was as follows :—

Year ended 30th June, 1910	..	..	..	£6,696
.. 1911	..	..	..	12,016
.. 1912	..	..	..	15,445
.. 1913	..	..	..	21,381

If either employers or workers are dissatisfied with the provisions of a Determination, they can appeal to the Court of Industrial Appeals, the constitution of which is a Supreme Court Judge, who then has full power to alter any part of the Determination.

In order to prevent the dismissal of any person who is unable to come up to the standard which must follow the fixing of a wage, there is a provision for issuing a licence to any person who, through age, infirmity, or natural slowness, is defective.

A very important visitor to Victoria in 1912 was Professor Matthew B. Hammond, Professor of Economics at the University of Columbus, Ohio. He spent three months studying the Victorian law and its working. He looked into every aspect of the case, the debates in Parliament, the law, the administration, and its general effect, visited factories, and attended many Wages Boards' meetings. Before leaving the State he expressed himself as being more impressed by the educative influence than by any other aspect of Wages Boards. He was struck by the fact that employer and worker met on equal terms, where each in the course of discussion grew to a better understanding of the difficulties that had to be contended with by the other, and to a better realization of the rights of the other side. He considers that this meeting on common ground has done more than anything else to smooth away difficulties, and that it accounts for the success of the law. In that connexion he noted the different position of parties in a Court of Conciliation and Arbitration, where they are at issue, and where the whole responsibility of decision lies in a Judge, who knows nothing about the trade he is dealing with, and can only obtain his knowledge at second-hand through the medium of sworn evidence, and who furthermore is necessarily remote from the

questions at issue by reason of his training and environment. Professor Hammond's conclusions, which have since been printed in different reports he has made in America, are all in favour of the Wages Boards as against the Court method of fixing wages and conditions.

The hours of closing shops are regulated by the Factories law. In this connexion, shops are divided into two broad classes—Fourth Schedule shops, and all others. The Fourth Schedule comprises such as chemists' shops, eating-houses, confectioners', fish and oyster shops, fruit shops, restaurants, tobacconists', and booksellers', which it is considered should be open almost continuously. These Fourth Schedule shops are allowed to remain open as long as the occupiers please, except in cases where a majority in a locality have petitioned and obtained a Regulation fixing their hours of closing.

All shops, other than Fourth Schedule shops have definite hours of closing. Butchers' shops, on account of the fact that they have to be open very early in the morning, are closed earlier than others—viz., on ordinary week days at five p.m., on Fridays at eight p.m., and on Saturdays at one p.m. With a few exceptions, all other shops close on week days at six p.m., on Fridays at ten p.m., and on Saturdays at one p.m. The closing at one o'clock on Saturday, or, as it is usually expressed, the Saturday half-holiday, is at present in force in the Metropolitan District of Melbourne, all cities and towns in Victoria, and in many other localities that have had a Regulation specially passed in that connexion. There is at present before Parliament an amending Bill, which will have the effect of making this Saturday half-holiday universal throughout the State. This provision, if it becomes law, will be a great boon to employés in shop, as well as to a large number of hard-worked shopkeepers. When in 1909 it was proposed to make it compulsory in Melbourne and suburbs, an outcry was raised in many quarters, and the belief was pretty generally held that many small traders would be ruined. The Saturday half-holiday, however, became law, and it was remarkable how quickly the whole community accommodated itself to the change. The housewife, who, it was believed, could not do without shopping late on Saturday to carry her over till Monday, found that Friday night, the night on which the shops remained open late, suited her purpose just as well as Saturday, and, before many months had passed, the same housewife, having found the benefits of a Saturday half-holiday, had no desire to revert to the old order of things. The idea of going back at the present moment would be scouted by all classes. Some of the larger traders say that they do better with the late closing night on Friday than when it was on Saturday, and they account for this by the belief that, under the new order of things, more money is spent in goods and less in alcohol.

The shops' provisions are carried out by the officers of the Factories Department, whose duties are to prosecute when this step is necessary to enforce the law, and to look after the welfare of employés generally as regards the provision of seats, fire escapes, &c. The Amending Factories Bill contains some provisions which propose to carry these duties further, and enable the officers of the Factories Department to insure a fixed cubical air space and many other sanitary provisions for the benefit of workers in shops.

The wages of apprentices in Victoria are fixed by the Wages Boards in each trade. These Boards also prescribe the form of indenture and the term of apprenticeship. Once a boy is indentured, it becomes the duty of the Factories Department, on the one hand, to see that he is taught his trade properly, and on the other to enforce his proper attendance at his work, and generally to protect both parties and see that they carry out the agreement.

A Conference on Apprenticeship sat in 1907, and recommended the adoption of a scheme similar to that in operation in Switzerland, Germany, and Austria, which would be under the supervision of a Commission chosen from employers and employés generally, and would include provision for technical training and supervision, with a view to producing thoroughly competent trained workmen in every trade. A Bill to carry this into effect was introduced into Parliament in 1912, but was objected to by the employers as casting too heavy a burden on them, and was consequently abandoned. During July and August of 1913 another Conference on the subject was held between employers and employés. That Conference has made a report to the Cabinet, and it is possible that early action will be taken to introduce legislation in order to carry its recommendations into effect. The recommendations are very much on the same lines as those of the previous Conference.

Increase of Wages due to Wages Boards. The following instances show how Boards have increased wages. The comparison is between the rate of wages before the Board was appointed and that in 1913 :—

Trade or Calling.	Number of Employés.	Average Weekly Increase in Wages for each Employé.	Average Annual Increase in Wages for each Employé.	Aggregate Annual Increase in Wages Divided among all Employés		
				£	s.	d.
Coopers ..	125	1 6 1	67 16 4	8,477	1	8
Bread ..	763	1 2 1	57 8 4	43,808	18	4
Brushes ..	132	0 19 9	51 7 0	6,778	4	0
Wickerworkers ..	192	0 18 7	48 6 4	9,276	16	0
Stonemasons ..	315	0 18 5	47 17 8	15,083	5	0
Woodworkers ..	3,033	0 16 7	43 2 4	130,772	17	0
Plate Glass ..	250	0 15 11	41 7 8	10,345	16	8
Glassworkers ..	612	0 15 9	40 19 0	25,061	8	0
Furniture (European) ..	1,398	0 14 11	38 15 8	54,219	2	0
Engravers ..	157	0 14 9	38 7 0	6,020	19	0
Breadearters ..	579	0 14 4	37 5 4	21,577	8	0
Boot Trade ..	6,043	0 14 2	36 16 8	222,583	16	8
Tanning ..	982	0 14 2	36 16 8	36,170	6	8
Bedsteads ..	329	0 13 11	36 3 8	11,904	6	4
Malting ..	131	0 13 9	35 15 0	4,683	5	0
Millet Broom ..	52	0 13 6	35 2 0	1,825	4	0
Jewellery ..	604	0 13 4	34 13 4	20,938	13	4
Electroplaters ..	162	0 13 3	34 9 0	5,580	18	0
Furniture (Wood Mantels) ..	175	0 13 3	34 9 0	6,028	15	0
Starch ..	154	0 13 3	34 9 0	5,305	6	0

**Wages in
Different
Industries.**

The following table shows the average weekly rate of wages paid to adult workers in 1912 in trades in which Special Boards have made Determinations :—

**AVERAGE WEEKLY WAGE EARNED BY PERSONS OTHER THAN APPRENTICES,
IMPROVERS, AND PIECE-WORKERS IN THE PRINCIPAL INDUSTRIES IN
VICTORIA IN 1912.**

Class of Trade.	Average Weekly Wage Paid to—		Class of Trade.	Average Weekly Wage Paid to—		
	Males.			Males.		
	s. d.	s. d.		s. d.	s. d.	
Aerated Water ..	44 5	..	Ironmoulders ..	57 4	..	
Agricultural Implements ..	55 5	..	Jams, Pickles, and Sauces ..	48 10	21 0	
Artificial Manure, Bonedust, &c. ..	50 3	..	Jewellery ..	66 3	43 9	
Bedsteads, Fenders, &c. ..	53 10	29 0	Leather Goods ..	57 5	23 2	
Boilermakers ..	59 0	..	Lift Attendants ..	43 10	..	
Boots ..	56 11	24 10	Livery Stables ..	44 8	..	
Boot Dealers ..	59 6	32 0	Malting ..	57 1	..	
Brassworkers ..	55 8	30 10	Marine Store ..	44 9	42 7	
Bread ..	63 7	..	Men's Clothing ..	64 6	..	
Bread-carters ..	48 8	..	Millet Broom ..	51 8	..	
Breweries ..	49 1	..	Millinery ..	..	32 4
Brick ..	54 4	..	Mining Engine-drivers ..	56 8	..	
Bricklayers ..	71 11	..	Night-Watchmen ..	50 5	..	
Brushes, Brooms, &c. (except Millet Brooms) ..	64 2	30 0	Organs ..	61 5	..	
Butchers ..	56 1	..	Ovens, Stoves, &c. ..	55 9	..	
Candles ..	46 8	..	Painters ..	60 8	..	
Cardboard Box ..	55 7	24 11	Paper Bags ..	66 2	22 0	
Carpenters ..	66 3	..	Pastry Cooks ..	56 2	48 9	
Carriage ..	61 1	32 0	Picture Framers ..	53 1	23 0	
Carters ..	47 10	..	Plasterers ..	71 5	..	
Cigars ..	48 8	31 6	Plate Glass ..	55 4	..	
Clothing ..	60 0	25 11	Plumbers ..	66 11	..	
Coal Miners ..	51 9	..	Polish ..	49 1	25 0	
Confectionery ..	58 8	22 1	Pottery ..	51 2	23 0	
Coopers ..	66 7	..	Printing (Metropolitan District) ..	64 3	23 11	
Cordage ..	48 9	22 9	Printing (outside Metropolitan District) ..	63 10	..	
Country Shop Assistants ..	51 8	34 5	Printing (Bookbinding) ..	63 10	22 10	
Cycles ..	52 5	..	Quarry ..	56 3	..	
Drapers ..	63 8	36 7	Refrigerating and Ice ..	60 8	..	
Dresses, Mantles, &c. ..	69 1	26 5	Rubber Goods ..	50 4	25 1	
Electrical Installation ..	63 9	..	Saddlery ..	56 9	25 3	
Electro-platers ..	36 8	..	Shirt ..	70 1	26 2	
Engineers ..	61 11	..	Soap and Soda ..	51 7	25 0	
Engravers ..	71 1	..	Starch ..	46 10	25 10	
Factory Engine-drivers ..	59 9	..	Stone-cutting ..	58 7	..	
Farriers ..	53 8	..	Tanning ..	50 6	..	
Fellmongers ..	45 6	..	Tea Packing ..	45 4	23 11	
Flour ..	49 11	..	Tinsmiths ..	53 7	..	
Furniture (European) ..	62 5	29 9	Underclothing ..	41 7	23 9	
" (Chinese) ..	64 10	..	Undertakers ..	54 1	..	
" (Bedding) ..	61 0	28 3	Watchmakers ..	74 7	..	
" (Carpets) ..	63 10	29 9	Waterproof Clothing ..	61 4	27 5	
" (Wire Mattress) ..	56 9	34 7	Wholesale Grocers ..	53 5	..	
" (Wood, Mantel-pieces and Overmantels) ..	60 10	..	Wicker ..	57 11	50 0	
," Dealers ..	63 10	..	Wire-workers ..	52 11	..	
Gardeners ..	46 4	..	Wood-workers ..	57 7	..	
Glass Workers ..	42 6	..	Woollen Trade ..	48 4	22 6	
Gold Miners ..	49 3	..				
Grocers ..	52 8	..				
," Sundries ..	48 9	24 9				
Hairdressers ..	52 8	46 9				
Ham and Bacon ..	54 7	..				
Hardware ..	60 7	45 0				
Hay, Chaff, Wood, and Coal ..	47 1	..				
Hotel Employés ..	46 2	31 6				

With a view to showing the present position of manufacturing industries in Victoria, tables are appended to this article containing statistical information in regard to the number of factories, the number of persons employed, the value of the materials used and of the output, &c.

VICTORIAN MANUFACTORY STATISTICS.

(SUPPLIED BY THE GOVERNMENT STATIST.)

FACTORIES.—WORKERS, WAGES, ETC., AND PRODUCTION, 1912.

Nature of Industry.	Number of Manufactories.	Average Number of Persons Employed—				Value of—			
		Males.		Females.		Wages paid exclusive of Amounts drawn by Working Proprietors	Fuel and Light used.	Materials used.	Articles produced or Work done.
		Working Proprietors.	Employees.	Working Proprietors.	Employees.				
Treating Raw Material, the Product of Pastoral Pursuits, &c.—						£	£	£	£
Tanning	55	62	1,475	1	10	168,567	10,935	1,050,941	1,371,741
Fellmongering	35	39	408	1	..	36,483	4,424	443,107	520,075
Chaff-cutting and Grain Crushing	202	214	656	4	13	51,281	8,249	698,614	827,921
Other	43	27	464	1	4	48,111	7,753	261,745	362,310
Oils and Fats, Animal and Vegetable—									
Oil, Grease, Glue, Soap, and Candle	21	9	612	..	42	67,824	11,529	428,229	632,707
Processes relating to Stone Clay, Glass, &c.—									
Brick, Pottery, &c.	119	102	2,014	..	33	236,526	75,195	48,387	508,593
Glass	28	37	1,031	..	4	109,308	24,327	70,191	254,095
Other	75	84	897	..	5	109,597	14,616	93,347	300,331
Working in Wood—									
Saw-milling, Moulding, &c.	342	383	6,006	..	30	659,503	10,547	980,565	1,992,628
Other	71	81	677	..	14	73,761	2,374	89,628	205,644
Metal Works, Machinery, &c.									
Agricultural Implement Engineering, Iron Foundry &c.	67	75	2,576	..	14	309,789	19,388	329,397	799,217
Railway Workshop	326	382	8,210	..	57	988,802	83,841	1,154,377	2,640,453
Sheet-iron, Tin, &c.	70	60	1,234	..	142	123,115	3,046	237,887	427,689
Other	236	281	2,420	2	42	244,791	17,869	438,700	876,248
Connected with Food and Drink, &c.—									
Butter, Cheese, Butterine Meat Freezing, Preserving, &c.	200	47	1,300	..	96	155,511	26,917	3,291,776	3,682,522
Biscuit	12	8	1,038	..	9	106,339	18,449	926,876	1,110,230
Jam, Sauce, &c.	5	4	875	..	515	95,770	9,225	366,796	599,178
Sugar, Confectioney, &c.	31	24	922	2	789	110,740	7,782	526,493	798,386
Aerated Water, Cordial, &c.	30	38	1,124	2	797	149,560	25,611	1,423,169	1,741,937
Brewing	152	140	1,029	4	39	108,714	3,965	190,491	476,033
Tobacco, &c.	29	24	984	..	..	149,605	24,619	436,717	980,927
Other	16	12	984	1	791	191,162	2,504	674,017	1,196,151
Clothing and Textile Fabrics, &c.—									
Clothing, Tailoring, &c.	442	399	2,104	21	8,067	625,300	11,924	1,024,987	2,020,029
Dressmaking and Millinery Underclothing, Shirt	491	78	178	367	9,162	398,638	6,656	760,967	1,406,273
Hat, Cap	156	64	217	103	5,861	265,366	7,085	553,005	926,026
Boot, Shoe	39	35	680	5	1,083	137,457	5,095	189,267	413,443
Other	151	183	4,134	7	2,450	570,025	9,292	1,182,045	1,951,998
Books, Paper, Printing, Engraving, &c.—									
Printing	350	415	4,863	7	1,113	696,626	21,710	641,358	2,029,904
Other	77	78	1,242	6	1,177	183,731	13,861	262,356	595,463
Musical Instruments	5	5	173	..	11	22,135	113	16,160	43,759
Arms and Explosives	9	8	229	..	470	60,074	1,908	131,511	215,516

FACTORIES. WORKERS, WAGES, ETC., AND PRODUCTION, 1912 *continued.*

Nature of Industry.	Number of Manufactories.	Average Number of Persons Employed—				Value of—			
		Males.		Females.		Wages paid exclusive of Amounts drawn by Working Proprietors.	Fuel and Light used.	Materials used.	Articles produced or Work done.
		Working Proprietors.	Employees.	Working Proprietors.	Employees.				
Vehicles, &c., Saddlery, Harness, &c.—									
Coach, Motor Building, Cycle	368	423	3,512	1	40	347,549	12,028	317,428	834,981
Other	66	76	634	1	61	70,353	686	100,152	205,471
Shipbuilding, Fitting, &c.	13	12	228	..	..	30,499	973	15,080	59,667
Furniture, Bedding, &c.—									
Cabinet, including Billiard Table	177	222	1,781	..	45	205,967	2,455	265,528	569,193
Other	78	69	908	5	233	104,333	4,116	244,469	419,271
Drugs, Chemicals, and By-products	88	94	1,332	4	374	162,971	12,097	631,310	1,069,246
Surgical and Scientific Appliances	18	8	74	..	8	8,128	420	6,843	21,375
Timepieces, Jewellery, and Platedware	85	99	861	..	77	104,274	2,907	187,411	382,168
Heat, Light, and Energy	90	20	2,726	..	306	405,919	50,804	326,609	1,319,674
Leatherware, except Saddlery and Harness	32	35	361	1	208	45,143	1,294	182,434	275,118
Wares not elsewhere included	40	37	1,184	3	363	149,580	11,577	506,928	774,165
Grand Total	..	5,263	4,732	72,833	593	37,950	10,102,244	683,376	27,002,302
									45,410,773

SUMMARY OF FACTORY STATISTICS, 1904 AND 1912.

		1904.	1912.
Number of Factories	..	..	4,208
Average Number of Hands Employed—			5,263
Males	..	..	50,554
Proportion per cent.	..	..	77,565
Females	..	..	66·3
Proportion per cent.	..	..	66·8
Total	..	..	25,733
		76,287	38,543
Value of—			33·7
Machinery, Plant, Land, and Buildings	..	13,668,185	33·7
Fuel and Light used	..	375,214	33·2
Materials used	..	13,356,103	19,457,795
Output	..	23,126,180	683,376
Wages paid (excluding Working Proprietors)	..	4,794,365	27,002,302
			45,410,773
Wages paid (excluding Working Proprietors)	..	4,794,365	10,102,244

Since 1904 the number of factories has increased by 1,055, or by about 25 per cent.; the number of hands employed by 39,821, or 52·2 per cent.; the value of machinery, plant, &c., by £5,789,610, or 42·4 per cent.; the value of output by £22,284,593, or 96·4 per cent.; and wages paid by £5,307,879, or 110·7 per cent.

Of the total wages paid during 1912, males received £8,388,613, and females £1,713,631, giving a yearly average for the former of £115 3s. 6d., and

for the latter of £45 3s. 1d., or, assuming that 52 weeks were worked, an average of £2 4s. 3d. for males (per week), and 17s. 4d. for females (per week).

STATISTICAL DEFINITION OF A FACTORY.

Any establishment employing on the average four persons or more, also those employing less than four persons where machinery is worked by other than manual power, whether the business carried on is that of making or repairing for the trade (wholesale or retail) or for export.



PROVISION IN VICTORIA FOR SICKNESS, UNEMPLOYMENT, OLD-AGE, AND DEATH.

*By James Ley, A.I.A., Assistant Actuary, Office of Victorian
Government Statist.*

In view of the recent passage of the British National Insurance Act, and of the prominence which has thereby been given to the provision made for insurance against sickness, invalidity, old-age, and unemployment in the case of the working classes in England, it will be of interest to know what has been done in this connexion by the Victorian Government. The following is a brief account of the means adopted by that Government to regulate and control the operations of insurance companies, friendly societies, trades unions, and kindred bodies, and of the development of these institutions.

Over the operations of life assurance companies practically no active control has been exercised by the Victorian Government. Legislation has been passed providing for compulsory registration; for a deposit of £5,000 with the Treasurer before a company can commence business; for the preparation of annual returns of a fairly comprehensive nature; for the making of actuarial valuations once in every five years, or at such shorter intervals, as may be prescribed by the instrument constituting the company; and for the furnishing of copies of the annual returns and abstracts of the actuarial valuations to the Registrar-General.

It is the practice for each company to make or arrange for periodical actuarial valuations for its own purposes. Its obligations to the Government, once the business has been established, are therefore practically limited to the furnishing of returns, in accordance with the provisions of the Act.

The extent to which life assurance business has developed in this State may be gauged from the fact that the number of life policies in force in Victoria at the end of 1912 was 331,846 (173,673 ordinary, and 158,173 industrial), and the amount insured by these policies was £40,132,346 (£36,822,720 ordinary, and £3,309,626 industrial). These figures refer only to simple life assurances, endowment assurances, and pure endowments. In addition to these there were 577 annuity policies in force, providing annual payments of £33,144.

There are in Victoria nine life assurance companies, whose annual premium income within the State exceeds £5,000 each. Of these three have their head offices in Victoria, three in New South Wales, and three in the United States of America. Formerly a number of British companies had branches in Victoria, but these have long since ceased to actively solicit business. The three largest American offices were for a long time formidable competitors of the local offices, but two of these have now practically ceased to accept new business, and the third has greatly curtailed its operations.

The following statement shows, for the latest year for which the full particulars are available, the annual premium incomes ("Victorian" and

"Total") and the total assurance funds of companies carrying on business in Victoria, whose annual premium income exceeds £5,000 :—

Society.	Year.	Locality of Head Office.	Annual Premium Income.				Total Assurance Funds Ordinary and Industrial.	
			Ordinary.		Industrial.			
			Victorian.	Total.	Victorian.	Total.		
Australian Mutual Provident ..	1912	Sydney ..	£ 629,022	£ 2,429,839	£ 38,624	£ 175,757	£ 29,995,127	
Mutual Life and Citizens	190,510	783,513	59,816	236,703	8,070,396	
National Mutual	Melbourne ..	222,427	921,966	..	..	7,291,292	
Colonial Mutual	64,930	502,026	20,300	77,034	3,516,149	
Australasian Temperance and General	51,145	165,709	66,466	174,833	1,363,374	
City Mutual	Sydney ..	29,595	44,902	..	..	586,727	
New York Life	New York ..	33,754	17,298,608	..	..	145,232,013	
Mutual of New York	5,777	11,652,368	..	..	120,568,428	
Equitable of United States	16,797	10,935,735	..	..	104,094,116	

The larger local companies are in a strong financial position, and their bonuses are on a liberal scale. This probably accounts for the fact that none of the larger British offices has in recent years endeavoured to enter into active competition with them in Australia.

There is in Victoria a number of accident insurance offices which issue policies covering various forms of accident insurance. These may be roughly

divided into two classes, namely, voluntary insurances taken out by the individual, and insurances covering the employer for legal liability to his workers. Policies of the former class, known as personal accident policies, are on lines familiar to most British communities, and do not to any considerable extent affect the working classes.

In regard to the second form of insurance, it may be explained that the employer is liable under the common law, which obtains in practically all English-speaking communities. Following the lead of Great Britain, Victoria in 1886 passed an Employers' Liability Act, whereby the worker was placed in a fairer position for establishing claims for injuries than he had been in under the common law. Insurance companies issue policies covering the employer for his liability to his employés under common law and the Employers' Liability Act. An extension of this form of policy is also very frequently issued, whereby an employer, in addition to providing for his legal liability, obtains compensation for his employés for all accidents occurring during working hours, apart altogether from the question of liability. There is no Workmen's Compensation Act in Victoria yet, although several efforts have been made to pass a Bill framed on somewhat similar lines to the English Act.

The amount of premiums received for accident insurance in Victoria in the year 1912 was about £112,000.

Although life assurance companies through their "industrial" departments do a considerable amount of business amongst the working classes, and these classes also receive benefit from insurances effected by employers with accident insurance companies, it is through the instrumentality of the

Accident Insurance.

friendly society and trade union that provision is more extensively made for the relief or maintenance of the workman during sickness, unemployment, and old-age, and for payment of funeral expenses. Friendly societies are co-operative associations, chiefly composed of working men, which grant in consideration of voluntary payments of weekly or monthly sums:—

- (1) Medical attendance and medicine to member, wife, and children under a specified age, usually eighteen years.
- (2) A weekly allowance in case of sickness of a member, usually commencing at £1 per week, and decreasing in amount as the period of illness extends.
- (3) A funeral allowance on the death of a member or his wife, generally £20 for the former, and £10 for the latter.

According to Dr. Baernreither, the author of *English Associations of Working Men*, friendly societies and trade unions had, in England, a common historical origin—the guilds of the fourteenth and fifteenth centuries—but the dividing line between the two institutions in Victoria has always been well defined. This is probably due to the fact that the former have always been regarded here as something in the nature of branches of the similarly named bodies in the Mother Country, and the distinctive features which characterized them there have been preserved throughout their history in Victoria.

The societies are of two kinds, those possessing lodges or branches, and those consisting of only one branch. The former are known as affiliated orders. Each society with branches is governed by a central body, consisting generally of about twelve members, who are elected at an annual meeting composed of deputies from all the branches. Each branch, although subordinate to the central body, controls its own affairs under the provisions of the rules formulated by the whole society, and appoints its own auditors and trustees. The investment of its funds is under the control of its trustees, except where all branch funds have been consolidated, in which case the moneys belonging to the whole society are invested by the trustees of the central body. To provide against the possibility of a branch being unable to meet its liabilities at any time, the rules of a society usually provide for the creation of a special fund—generally called the District Relief Fund—the function of which is to enable the central body to help a necessitous branch.

Friendly societies seem to have been established in Victoria very soon after the first settlement of the territory, but it was not until after the passing of the 1855 Act that any steps were taken for their registration as institutions recognized by law. That statute consolidated and amended the laws then in force relating to friendly societies, and was the first Act passed in this connexion by the Victorian Legislature after the separation of Victoria from New South Wales in 1851. It was assented to on 12th June, 1855, and provided for the appointment of a registrar, and also a certifying barrister, to whom the rules of a society had to be submitted for examination, and whose certificate, that these rules were in accordance with the law, was necessary before registration could be effected. It also provided that the table of contributions had to be certified to by an actuary of an assurance

company, or "some person" appointed by the registrar before the latter could register the rules of the society.

Registration was not, however, made compulsory, and the actuarial certificate given by the actuary appointed by the registrar, under the provisions of the Act, for this purpose, was only of a provisional nature, issued under the condition that the tables were to be submitted to him for approval after a certain period had elapsed. This temporary certificate was given because there were no data then available in Australia on which to calculate the amount necessary to provide the sickness benefits. As there was nothing in the Act to compel a society to apply to the actuary for a renewal of the provisional certificate when the time covered by that certificate had expired, the registration of these institutions was unfortunately permanently effected at what afterwards proved to be, in almost every instance, inadequate rates of contribution. The control exercised over friendly societies as a result of this legislation was very slight.

No further serious attention was given by the Government to friendly societies until 1875, when a Commission was appointed to inquire into "the working of the Friendly Societies Statute, the position and operations of the societies registered under it, and what amendment, if any, is desirable in the existing law." The outcome of this Commission was the 1877 Act, which provided (*inter alia*) for the appointment of a fully qualified barrister as registrar, and also that each society should furnish returns annually to the Government Statist, and once at least in every five years should either have its assets and liabilities valued by a valuer appointed by the society or send such particulars to the Government Statist as would enable him to have the valuation made. The fees for valuation were purposely fixed at a low rate, and average no more than threepence per member, the result being that, although it is competent for the societies to employ outside valuers, should they desire it, as a matter of fact they have rarely done so, and nearly all the valuations have been made by the Government Actuary. The passing of this Act had the effect of considerably increasing the control exercised by the Government over the operations of friendly societies.

In accordance with its provisions, an actuary was appointed under the Government Statist in 1881, whose chief duty was to make periodical valuations of the assets and liabilities of societies, and the result of these valuations disclosed the fact that, in almost every instance, the rates then being paid by the members were insufficient to provide the benefits which the societies had by their rules agreed to pay. The Act gave no power to enforce payment of adequate rates of contribution, and the actuary could not therefore compel a society to take such steps as would enable it to meet its liabilities, but could only give advice as to the best means to be adopted to secure that end. It is only just to the managing bodies of these institutions, however, to state that most of the principal societies made a serious effort to carry out the suggestions of the actuary. Several of them passed rules requiring future members to pay adequate rates of contribution, and in nearly every case some effort was made to improve the financial position.

It was not until 1907 that registration of societies was made compulsory, and that they were required to adopt adequate rates of contribution in respect of all members, existing as well as new members. An Act which

was passed in that year embodied these provisions, the penalty for failure to adopt adequate rates of contribution being cancellation of registration. The operation of the Act, in so far as it related to the scale of contributions payable, was, however, limited to a period of eighteen months. This was a serious defect, as contributions which are sufficient at one time may at a future date become inadequate, owing to fluctuations in interest, sickness, or mortality rates or faulty management.

To remedy this defect an Act was passed in 1911, which required societies to adopt adequate rates whenever called upon to do so by the actuary. With a view, however, to avoiding the inconvenience which might be caused by their having to make important alterations on short notice, it was provided that they need not adopt such rates until after having received two notices from the actuary, with an interval of at least three years between them.

The legislation to which I have referred has had a very beneficial effect on societies. Of fourteen societies having a membership of over 500 each, eight have assets whose ratio to liabilities exceeds, or closely approximates, to 20s. in the £, and only in one case is the ratio less than 17s. in the £. In Victoria the societies have received no subvention from the State.

The Government has been assisting these institutions in other directions. They have dispensaries for supplying their members with medicine, but prior to 1907 it was not lawful for these to sell patent or other medicines to members of friendly societies or their relatives. This restriction was, however, removed by the Act passed in that year, so that all benefit members, who have paid the full subscription required in connexion with the dispensary and the contribution to the society for medicines and medical appliances, may now be supplied with any medicines for which payment is required.

The following statement shows the nature of the securities in which benefit funds of the societies were invested at 31st December, 1912:—

Nature of Security.	Amount Invested.	Proportion to Total Funds.
Mortgages	£ 1,158,842	53
Debentures	219,200	10
Victorian Government Special Inscribed Stock	310,011	14
In banks at interest	356,407	16
In halls and other freehold property	96,166	4
Proportion invested .. . . . .	..	97
Cash not bearing interest	59,927	3
Improperly in use by other funds	6,165	(·3)

The third item in the above list, "Victorian Government Special Inscribed Stock," refers to a stock which was created for the special benefit of friendly societies by an Act passed in 1910. Investment is optional, but redemption can only take place on the happening of certain events, such as a transfer of engagements or dissolution of a society, or similar occurrence, or when money is wanted by a society to enable it to pay the benefits for which it is liable under its rules. The stock is not marketable or redeemable for any other form of investment. The rate of interest is 4 per cent., so that societies can if they

choose invest all their funds at this rate of interest without incurring any risk. The Act of 1907 provided that in lending on freehold property only first mortgages should be taken, and that the amount advanced should not exceed three-fifths of the value of the property as given by a practical valuer.

The progress made by friendly societies in this State since the year 1880 may be seen from the following table :—

Year.	Membership.	Annual Revenue.	Annual Outgo (other than Management Expenses).	Funds.
1880	..	46,385	171,987	103,594
1890	..	88,134	322,747	198,099
1900	..	98,985	372,631	232,049
1910	..	142,275	534,616	301,395
1912	..	153,921	580,371	317,415

The rates of benefit vary, but those most commonly payable are 20s. per week during the first six months of sickness, 10s. per week during the second six months, and 5s. per week thereafter so long as the sickness continues. In addition there are funeral benefits of £20. payable on the death of the member, and £10 payable on the death of his wife should she predecease him.

The primary object of trades unions in Victoria is to regulate the relations between workmen and employers, or between workmen themselves in regard to the conditions or conduct of any trade or business, such as wages,

hours of labour, hygienic conditions under which members **Trades Unions.** are working, &c. Incidentally they also make payments to their members during sickness and unemployment, and at death sums for funeral expenses are allowed. The payments in connexion with these subsidiary benefits are however dependent on funds being available in the union.

In 1884 the first Act was passed in connexion with trades unions. This Act provided for voluntary registration.

A consolidating Act was passed in 1890, and, as since amended, this Act exempts trades unions from the provisions of the Friendly Societies Acts. Since registration is voluntary, only a few unions have taken advantage of the provisions of the Act, and consequently the particulars published by the Government each year regarding registered unions give no reliable indication of the number of members or of the financial strength of the trades unions of Victoria.

The Commonwealth Statistician (Mr. G. H. Knibbs, C.M.G.) has, however, obtained information in regard to unions existing in the different States of Australia, and statistics published by him show that in 1912 there were in Victoria 151 separate trades unions having a membership of 116,557.

It will be seen that the Government exercises practically no direct control over trades unions in their financial operations in this State.

A number of institutions, including banks, large commercial houses, public companies, &c., have provident funds, the chief object of which is to secure pensions for employés in old-age and allowances during incapacity

caused by ill-health. Such funds also exist in connexion with some of the larger religious bodies. Provision for the benefit is usually made

Provident Funds. by joint contributions from the employer and employé. In the case of a public company, or where persons are compelled

to join as a condition of employment, the Government has no control over the fund. In other cases the fund is nominally a friendly society, and is subject to the provisions of the Friendly Societies Acts.

The institutions referred to above perform the functions for which they exist without financial assistance from the Government, except that in the

State-aided Institutions. case of friendly societies, a few concessions of a minor nature are granted. There are many other agencies, wholly or

partially supported by the Government, which grant relief in cases of sickness and distress; but as these are referred to in an article on Public Charities, which appears elsewhere in this handbook, I do not refer to them here.

The Commonwealth Government grants pensions to males on attainment of the age of 65, and to females on attainment of age 60, also invalid pensions to persons under these ages, but above the age of 16, who become permanently incapacitated for work by reason of accident or invalidity. The rate of

Government Pensions and Allowances. pension must not exceed £26 per annum, and must not be at such a rate as will make the pensioner's income, together with the pension, exceed £52 per annum. A condition of the

granting of the pension is that the applicant must have resided in Australia for twenty years before he can receive an old-age pension, or for five years before he can get an invalid pension. An applicant for an old-age pension must be of good moral character. Of the persons in Victoria who are eligible on an age basis, about 30 per cent. are receiving old-age pensions.

Persons who joined the Victorian civil service, prior to 24th December, 1881 (including State-school teachers), railway servants who were appointed before 1st November, 1883, and members of the police force who entered previous to 25th November, 1902, are entitled to pensions on retirement, for which they have not been required to make any contributions. Those who have entered since the dates mentioned receive no pensions, but are compelled to insure their lives for an amount, which usually does not exceed the maximum yearly salary for the class of work performed by them.

An Act was passed by the Commonwealth Government in October, 1912, providing for a payment of £5 to the mother of every child born in the Commonwealth, only one such payment being made in case of twins. During the first nine months of the operation of the Act the allowance was claimed in respect of nearly 90 per cent. of the total confinements in the Commonwealth.

There is no legislation in the State dealing specifically with unemployment. The Government has a Labour Bureau and a Labour Colony, which

Provision for Unemployment. were established with a view to alleviating distress due to unemployment. These are not charitable institutions,

in the ordinary sense of the term, but a reference is made to them in the article on Public Charities to which I have already alluded.

It will be seen from the above that extensive provision has been made in Victoria to indemnify workers and those dependent on them against the loss which would otherwise be sustained on a wage-earner dying or becoming incapacitated for work through old age or invalidity. Notwithstanding this

General. provision, there is a considerable amount of poverty in the State. While the distress caused by this is not nearly so great as in the crowded countries of the old world, the problem of how to deal with it is one which is constantly exercising the minds of statesmen and other persons who take an active interest in the amelioration of social conditions.



PUBLIC HOSPITALS AND CHARITIES OF VICTORIA.

By T. E. Meek, Chief Clerk of Victorian Treasury, and formerly Inspector of Charities.

Happily, in this country, we have no permanent pauper class, although we find cases of distress caused by illness, temporary unemployment, and old age.

In Victoria, there is no special taxation by the Government in aid of charities, nor, with one or two minor exceptions, do any municipalities levy rates for this purpose. The different charitable agencies are maintained, in most instances, partly by Government grants out of the general revenue, and partly by private aid. In some instances, they depend entirely on private aid.

There are practically no charities in the State solely maintained by Endowment Funds. Up to the present no difficulty has been experienced in obtaining funds for all the various charities. The public have always readily responded to appeals made on behalf of any Institution or Society. In fact, there has in the past been too much readiness displayed in establishing charities not really required, with the result that a considerable amount of overlapping is found in charitable work. Unlike some of the other Australian States, there are no charities wholly maintained by the Government in Victoria, with the exception of a Depôt for Neglected and Reformatory Children, a Consumptive Home, and a small Labour Colony. Similarly, there are no charities supported entirely by municipalities.

In considering the Charities of the State, no reference will be made in this paper to Lunatic Asylums, as they are not in a strict sense charitable institutions. It is true destitute persons who become of unsound mind are sent there, but it is equally true that people who are not, from any point of view, objects of charity, are also maintained there, and pay for their maintenance.

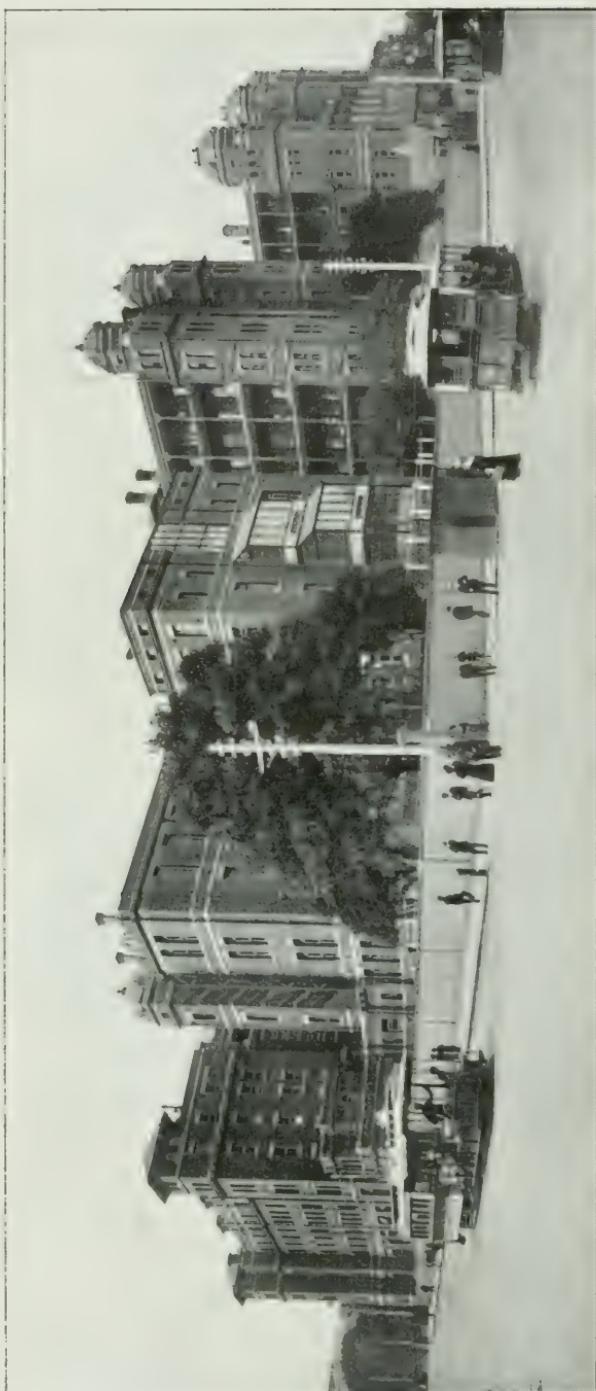
Very early in the history of Victoria the need for charitable institutions made itself felt. Within five years of the foundation of what is now the City

Growth of Charities. of Melbourne, the necessity of providing accommodation for the sick poor became apparent, and a small cottage rented

for the purpose was used as an hospital. In 1848 a new building, providing 21 beds, was opened. The buildings gradually extended to meet requirements until accommodation for over 300 beds was provided.

The Melbourne Hospital has always been the leading Hospital of the State, and is the chief training school for medical students. A new Hospital is now in course of erection, to take the place of the old buildings, and is nearing completion. The new structure is to cost £260,000 and will contain 450 beds.

In 1868 a second general Hospital—the Alfred Hospital—was erected in Melbourne to commemorate the escape of His Royal Highness Alfred, Duke of Edinburgh, from assassination during his visit to Sydney. This institution now contains 168 beds.



MELBOURNE HOSPITAL.

In 1869 a Homœopathic Dispensary was established, and gradually developed into the Homœopathic Hospital—the third general Hospital in the city—which has accommodation for 102 in-patients.

The St. Vincent's Hospital, founded in 1893 by the Sisters of Charity, completes the list of general Hospitals in the metropolis. It is an up-to-date building, containing 138 beds.

The Women's Hospital, providing 119 beds, for maternity cases and diseases of women, was founded in 1856; the Eye and Ear Hospital, with 84 beds, was established in 1866, and the Children's Hospital, which now has accommodation for 137 children, in 1870. The Austin Hospital, for the treatment of incurable patients, was opened in 1880. The Queen Victoria Hospital, a small institution of later origin, is another Hospital for the treatment of diseases of women and children, and is managed and staffed by women.

A few years after the establishment of the Melbourne Hospital, similar institutions were opened in the gold-fields and other centres, and gradually increased in number. To-day there are in all 45 public Hospitals in Victoria.

Benevolent Asylums, somewhat after the nature of the Poor Alms Houses of Great Britain, were instituted very soon after the first Hospital was opened. There are now six of these in the State, and eight of the Hospitals, in addition to ordinary work of a medical and surgical character, provide accommodation for Benevolent Asylum cases. Attached to each Benevolent Asylum are infirmary wards, which are usually under the control of a trained female nurse.

Special Institutions for the Blind, for the Deaf and Dumb, and for Orphans were instituted early in the sixties, and there are now also Refuges for Women, Foundling Hospitals, Dispensaries, Convalescent Homes, a Home for Epileptics, Ladies' Benevolent Societies, and other charitable agencies.

In addition to the charitable agencies already mentioned, a Charity Organization Society was founded in 1887, on similar lines to the societies of the same name in Great Britain and America.

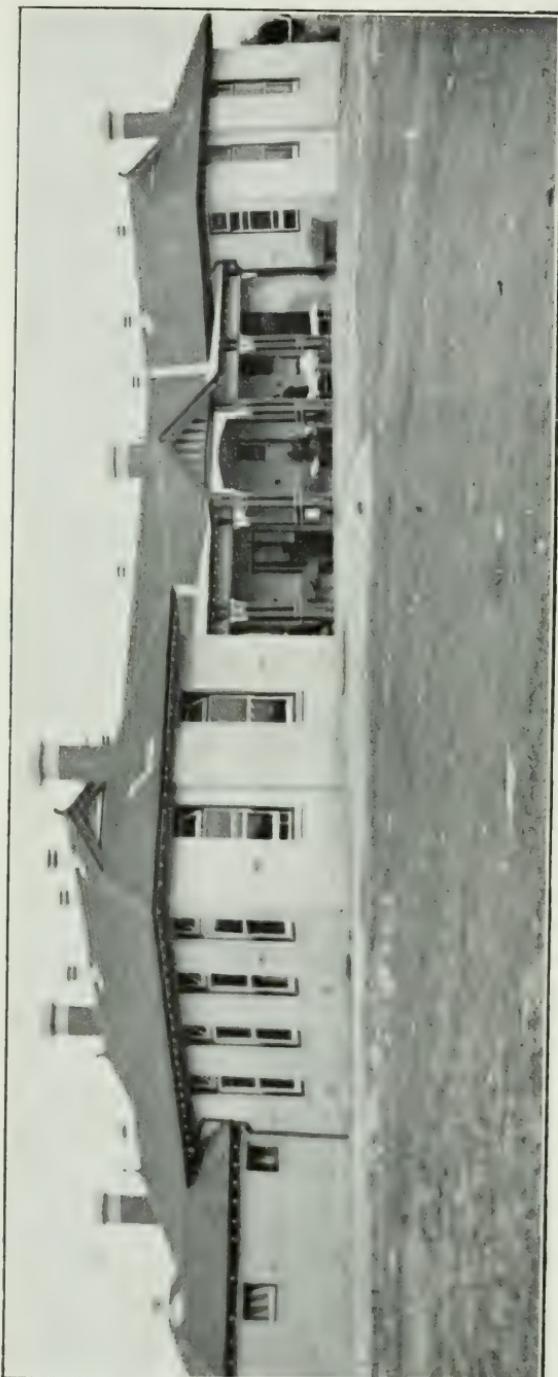
The care of consumptives is under the control of the Public Health Department. At Broadmeadows, a few miles from Melbourne, the Government in

Care of Consumptives. 1905 established a Sanatorium for the reception of patients likely to improve under treatment. At this institution there is accommodation for 90 patients. In the country, accommodation is provided at the Amherst Hospital for 62 of a similar class of patients. At both of these Sanatoria patients whose circumstances warrant it are admitted free.

The Government has also recently erected at its own cost, at Cheltenham, a modern hospital building named the Heatherton Sanatorium for the reception of advanced cases of consumption. This Hospital provides 100 beds. The cost of maintaining the institution is divided equally between the Government and the Metropolitan Municipalities.

Cases of advanced consumption are also received at the Austin Hospital for Incurables, where 125 beds are reserved for this purpose.

The special expenditure incurred in connexion with the care of consumptives is not a charge to the Charities Vote. It is provided in the ordinary appropriations of the Health Department.



CRESWICK HOSPITAL.

**Neglected
Children and
Reformatory
Schools.**

A separate State Department deals with Neglected Children and Reformatory Schools, and arranges for the boarding-out to their mothers, or at approved homes, of children found by the Courts to be neglected. The payments range from 5s. to 12s. per week until the child has attained the age of fourteen years. Incorrigible boys and girls are sent by courts to approved reformatories where the cost to the Government for each child is 10s. per week.

The Department mentioned also administers the Infant Life Protection Act, which forbids the boarding-out for payment of any infants unless to an approved person. All payments to such approved persons are made through the departmental officers.

On the 31st December, 1912, there were 5,969 neglected children boarded out; 613 were in service, and 673 on probation with relatives, in both cases without cost to the Government; and 342 were in institutions.

The number of reformatory children supervised at the same date was 187, making the total number of children under control 7,784. The total cost of the Department for the year was £103,093.

The expenditure by the Department is provided for separately in the annual Appropriation Act.

To commemorate the 60th year of the reign of Queen Victoria, a public fund was opened in 1897 for the purpose of building an Infectious Diseases Hospital. The Hospital was duly established and now provides accommodation for 150 patients. Half the cost of upkeep of the Hospital is borne by the Government, and the other half by the Metropolitan Municipalities.

Under the Health Act, the burden is cast on the Municipal Councils of providing accommodation for infectious diseases. This is generally done through the medium of the local public hospital, at which there are special infectious diseases wards situated apart from the ordinary hospital buildings. The municipalities can claim on the Government for a proportion of the amount expended by them.

A recent movement has resulted in the establishment of Crèches or Day Nurseries, where women may, while earning their livelihood, leave their young children in safe custody. Kindergarten methods are adopted at these Crèches, of which there are at present six.

Free Kindergartens have also recently been inaugurated with the object of keeping young children off the streets and placing them in healthy and cheerful surroundings. There are seventeen in Melbourne and suburbs, and two in country centres.

Three years ago a Bush Nursing Association was started in Victoria. The Association aims at providing trained nurses for the sick in country districts who are unable to engage such assistance. The nurses work under the direction of the medical practitioners of the district, and their salaries are guaranteed by the local residents.

Up to the present eleven nurses have been installed.

**Bush
Nursing.**

Old-age and Invalid Pensions. Old-age and Invalid Pensions are granted by the Commonwealth Government. In Victoria 26,332 persons are in receipt of Old-age Pensions, and 4,180 persons draw Invalid Pensions.

The pensions are claimable by law as a right, and not as an act of grace.

In order to minimize, as far as possible, the evils of unemployment, the Unemployment. Government has established a Labour Bureau where applicants for work can register their names. Government officials endeavour to obtain employment for such persons on public works, or with private employers.

There is a Labour Colony, under Government control, where able-bodied destitute men are afforded temporary relief at sustenance wages. The colonists are instructed in general work and farming, dairying, and fruit and vegetable growing.

With few exceptions, the Charities are managed by committees appointed by subscribers, and are supported chiefly by private aid, Management. augmented by grants from the Government, and to a lesser extent by votes from the Municipal Councils. The Government is not represented on these committees.

All the Hospitals are subsidized by the Government, and the conditions of the grant limit those eligible for admission to—

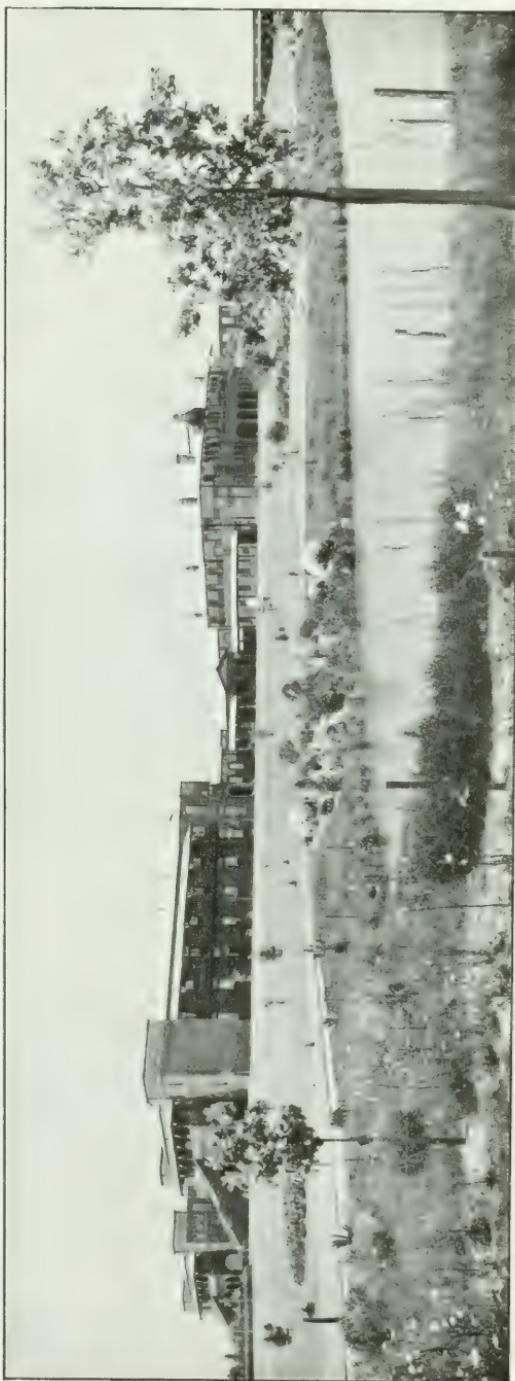
- (1) persons who are in destitute circumstances ;
Admission to Hospitals, and Medical Staff. (2) persons who can make a statutory declaration that they are unable to pay the ordinary medical and nursing fees, but are willing to contribute according to their means towards their maintenance in the institutions ;
(3) accident or casualty cases.

The Hospitals are staffed, as a rule, by honorary medical officers, the leading surgeons and physicians giving their services gratuitously.

An annual collection in aid of the Medical Charities is made in Melbourne and suburbs on a specified Saturday and Sunday in each year. Since the inception of the movement in 1873, the sum of £307,028 has been collected by this means. The last appeal resulted in the raising of £11,806.

The following statement will give some idea of the extent of the work undertaken by the subsidized charities of the State for the year ended 30th June, 1913 :—

Description of Charity.	Number.	Beds Provided.	Average Cost per Bed	Total Revenue.	Total Expenditure.
Hospitals ..	45	3,151	72·8	250,729	295,639
Hospitals and Benevolent Asylums combined ..	8	728	66·4	22,663	22,314
Benevolent Asylums ..	6	2,174	21·4	45,250	43,090
Orphanages ..	6	1,028	15·8	17,179	17,729
Female Refuges ..	9	722	29·8	21,500	20,482
Other Institutions ..	6	413	42·6	21,464	23,817
Ladies' Benevolent Societies ..	74	..	..	19,050	19,138
Totals ..	154	8,216	..	397,835	442,209



MELBOURNE BENEVOLENT ASYLUM AT CHELTENHAM.

The endowment and reserve funds amount to £273,741.

The following figures show the chief sources of revenue for the year ended 30th June, 1913 :—

Government Grant	£104,000
Municipal Grant	11,000
Contributions raised locally	79,000
Patients' contributions	41,000
Interest on investments	11,000
Inmates' labour	15,000
Other sources	19,000
Legacies	37,000
Contributions, &c., to building	61,000
Ladies' Benevolent Societies	12,000
Special donations (extraordinary income)	7,000
Total	£397,000

There is at present practically no legislation dealing with the charities in Victoria. The few Acts relating thereto which have been passed are merely machinery measures which provide for the appointment of committees, and give them power to sue and be sued. No policy has been laid down, and it is quite optional with the charities whether even the machinery clauses so provided are availed of.

Charities which are not subsidized by the State are not under control of any kind, unless the buildings are so insanitary as to compel the Health Department to take action

The charities subsidized by the Government (and these embrace all the principal institutions) are under control to the extent that they are subject to official inspection, and, unless the wishes of the Government are given effect to, the State aid can be withdrawn.

The institutions subsidized out of the Charities Vote may be classified as follows :—

- Hospitals.
- Benevolent Asylums.
- Hospitals and Benevolent Asylums combined.
- Orphanages.
- Refuges for Fallen Women.
- Special Institutes for the Blind, Deaf and Dumb, Infants, and Epileptic.
- Ladies' Benevolent Societies.

These institutions, with the exception of a few under the control of church organizations, are, as previously stated, managed by committees appointed by subscribers. The nature of the work undertaken by these institutions speaks for itself, with the exception, perhaps, of that performed by Ladies' Benevolent Societies, which are specially referred to later on.

Parliament sets aside a sum annually as a grant to charitable institutions. For some years past the amount of the grant has been £104,000. The Treasurer attaches such conditions as he deems fit to the Government Grant to each institution. This gives him a controlling power—the power of the purse. There is, as already indicated, no special taxation for the charities, the grants being a charge against the ordinary revenue of the State.

The basis of the allocation of maintenance grants to the larger charities is the number of occupied beds for the previous year. Having determined the amount the different charities are entitled to on this basis, consideration is given to—

- (1) the local support given to the institution;
- (2) the fact whether the institution is managed economically or otherwise;
- (3) as regards Hospitals, the average stay of in-patients;
- (4) the financial position of the institution;
- (5) any special circumstances, such as the isolated position of an institution, or the fact that it is situated in a scattered district.

These factors may vary the grant to which an institution is entitled on the basis of the number of beds occupied.

It may here be mentioned that one of the conditions of the Government Grant is that, before the amount can be claimed, subscription lists equal to one-third of the sum must be furnished.

Upon an institution applying for a Building Grant, the Inspector of Charities is called upon to report as to the merits of the proposal. If it be decided that the suggested buildings are required, the plans are submitted to the architects of the Public Works Department, who recommend any alterations or improvements considered necessary or desirable. When an estimate of the cost of the work is obtained, the Treasurer allots such proportion as in his opinion is fair, taking into consideration the ability of the district to raise funds for itself, and the demands on the vote for the year. Rarely, if ever, of late years, has the Government contributed to the extent of £ for £.

The Inspector of Charities is an officer appointed by the Government, whose salary and expenses are defrayed from the Charities Vote. He visits the various subsidized charities and reports thereon to the Treasurer. A copy of his report is forwarded to the institution concerned, and a reply asked for. If on any point the inspector and the committee of the institution disagree, the Treasurer arbitrates, and, if the matter in dispute is of sufficient importance, he withholds payment of the Government Grant until the committee gives effect to the wishes of the Department. All the books of the institutions are open to the inspector.

An annual balance-sheet, supported by a statutory declaration, must be furnished to the Treasurer, together with any statistical information which he may desire. The balance-sheet must be signed by two auditors.

Out-door relief, other than medical attendance, so far as the subsidized institutions are concerned, is afforded either through Benevolent Asylums or Ladies' Benevolent Societies, but particularly through the latter. Each lady on the committee of a Ladies' Benevolent Society is allotted a district. An applicant for eleemosynary aid in that district is visited by the lady, who reports to the committee. The relief afforded is generally by orders on grocers for goods, but it is sometimes given in cash. In some instances rent is paid. The main object of these societies is to assist widows or deserted wives, but their work really embraces all cases of distress.

Maintenance Grants.

Building Grants.

Inspector.

Balance-sheet and Statistics.

Out-door Relief.



HEATHERTON SANATORIUM.

It may perhaps be of interest to note that these societies help classes of persons who are not legally eligible for old-age or invalid pensions. The Treasurer encourages the societies to assist all cases of distress, and in a general way provides them with any funds they require in addition to the money subscribed by the public.

It may be here mentioned that the Treasurer himself grants what are termed compassionate allowances, up to 10s. per week, in special cases which do not come under the purview of the Ladies' Benevolent Societies.

The defects of the Victorian system are obvious. They may be summarized thus—

Defects of the System.

- (1) Want of continuity of policy, caused by changes of Treasurers or of Inspectors of Charities, by whose advice, in a large number of instances, the Treasurer must be guided.

- (2) The lack of any control of non-subsidized charities.

The present Premier of Victoria (the Honorable W. A. Watt) lately introduced a Bill into Parliament to remedy these defects.

Proposed amending Legislation. The Bill endeavours to place the charities of the State on a more defined basis. It is proposed to appoint a Board of three paid members which will have control over all the charitable agencies of this State. The internal administration is left in the hands of committees appointed by subscribers.

All charities must be registered, and the Board will have power, for sufficient reasons, to remove the name of any agency from the register. Any charity so removed is prohibited, under a heavy penalty, from applying to the public for support.

Provision is also made that the Board may, with certain limitations, amalgamate or close any subsidized institutions. The Bill further gives the Board power to establish or to encourage the establishment of intermediate hospitals, which are half-way institutions between private hospitals and charitable institutions. All persons admitted to intermediate hospitals will, under the provisions of the Bill, obtain nursing and medical attention, as well as medicines, for a fixed weekly amount.

So far as I have been able to discover, in no other country has such a comprehensive legislative scheme been introduced to deal with the question of a central control of all charitable agencies.





(COLLINS STREET, MELBOURNE.

THE PENAL SYSTEM OF VICTORIA.

By G. F. Dicker, of the Victorian Penal Department.

Victoria, or, as it was first called, the District of Port Phillip, was a portion of the Colony of New South Wales until the 1st July, 1851, and the history of its Penal and Gaols System up to that date belongs, consequently, to that Colony. Two attempts were made to form a Penal Settlement within the present boundaries of Victoria, one by Lieut.-Col. Collins, in 1803, at Sorrento, and the other by Captain S. Wright, in 1826, at Settlement Point, on the mainland at Western Port; both, however, were abandoned after a short trial.

Early History.

It is gratifying to note that Victoria was founded by free settlers, though it was not until the year 1834 that the Messrs. Henty, at Portland, and the year 1835 that the members of the Batman Association, Melbourne, arrived with their flocks and herds from Tasmania and became the earliest colonists.

On the 14th September, 1836, Captain Wm. Lonsdale was gazetted the first Police Magistrate of the District of Port Phillip, and arrived at Melbourne, from Sydney, in H.M.S. *Rattlesnake*, on the 29th of the same month. The staff appointed to assist Captain Lonsdale consisted of one district, and two ordinary, constables and a clerk. Prior to his advent, disputes had been referred to three arbitrators selected by the settlers themselves on their own initiative, and they subsequently, by a formal document dated 1st June, 1836, agreed, until a Magistrate should arrive, to submit disputes to the arbitration of Mr. James (afterwards Sheriff) Simpson.

In November, 1837, there appears to have been a gaol in Melbourne, but it was only a temporary one, and an official report describes it as a "hired slab building," very insecure, and altogether unfit for the purpose.

At the Court of Quarter Sessions, during 1839, there were 38 criminal convictions in a population of 8,500; and, in 1840, 27 criminal convictions in a population of 13,000.

New South Wales Act of Council 4 Vic. No. 29, 16th December, 1840, is the first Act in which Melbourne Gaol is mentioned. It gave the Sheriff of New South Wales control of all prisoners confined therein, and provided for control in the district of Port Phillip by a deputy sheriff, as soon as such officer should be appointed.

The permanent gaol at Melbourne was commenced in 1841, the expenditure on the building in that year being £5,305, and in 1842, £14,308.

Until the year 1850 prisoners convicted of serious offences were sent either to the Penal Establishment at Cockatoo Island (Sydney Harbour), or to some other place of detention in the Middle District of New South Wales. Towards the end of 1850 a draft of 25 prisoners was sent from Cockatoo Island to Melbourne, and these, with about 35 others from the local gaols, were placed under the superintendence of Mr. Samuel Barrow, and thus was commenced the Penal, in contradistinction to the Gaol, System of Victoria. Work was begun at Pentridge, about 5 miles north of Melbourne, by the erection of two movable wooden buildings, each containing sleeping berths for 40 prisoners, keepers' quarters, and a guard house and barracks for the

military guard. The prisoners were employed in forming the roads in the vicinity. The daily average number of prisoners at Pentridge in the early part of 1851 was 68, the number of officers 18, and the military guard 16.

Victoria was separated from New South Wales on 1st July, 1851, and immediately after the separation Mr. James Simpson was appointed Sheriff, with control over all Gaols. At the same time Mr. Samuel Barrow was appointed to the position of Superintendent of the Penal Establishment at Pentridge, the office he had hitherto held under the New South Wales Government.

On 1st September, 1851, the Government commenced the issue of licences to mine for gold, and the consequent rush of all classes to participate in the rewards of mining, and the attraction to the Colony of desperate characters from all quarters, soon rendered necessary considerable changes in the Penal System, the first change being the provision of Stockades, and the second that of Floating Prisons.

Stockades, or Houses of Correction, with reserves attached, were proclaimed as follows:—

Place.		Date of Proclamation.		Area of Reserve.
Pentridge Stockade	..	20th April, 1852	..	45 acres
Richmond Stockade	..	23rd June, 1852	..	25 ,,
Collingwood Stockade	..	21st February, 1853	..	6 ,,
Marine Stockade	..	7th September, 1853	..	1 acre

All the Stockades were subsequently abandoned with the exception of Pentridge, which then became the Penal Establishment for the whole of the Colony.

By Act of Council 16 Vic. No. 32, 22nd January, 1853, the old legislation relating to Gaols was repealed, and provision made not only for Gaols and Houses of Correction, but also for hulks or floating prisons. Control was placed in the hands of the Sheriff and such other officer as the Lieutenant Governor should appoint.

Immediately after the passing of this Act, steps were taken to transfer the most dangerous criminals to the hulks, which afforded better provision for safe keeping than did the temporary buildings at the Stockades. The hulks were proclaimed Public Prisons on the following dates:—

Name of Hulk		Date Proclaimed.		Accommodation for Prisoners.
President	..	1st February, 1853	..	80
Deborah	..	1st February, 1853	..	..
Success	..	27th June, 1853	..	130
Sacramento	..	15th March, 1854	..	128
Lysander	..	20th March, 1854	..	300

Long sentence men, over ten years, were sent to the *President* and put in irons in separate confinement and without employment, as it was not considered safe to allow them to go on shore to work. Men were selected from the *President* for removal to the *Success*, and were employed ashore in quarrying and stone cutting, and from the *Success* they passed to the *Sacramento* and were put to similar work. Those who evinced a desire to behave themselves and be industrious passed on to the *Lysander*, and thence to the Stockades at Collingwood and Pentridge. Short sentence men, originally free and not previously convicted, were sent from the gaols to the *Lysander*. The *Deborah* was first set apart for refractory seamen, but was subsequently used for the detention of juvenile offenders until the passing of the Neglected and Criminal Children's Act in 1864.

The system of hulks was reported, in 1857, by the Select Committee upon Penal Discipline, to be a complete failure. It was found impossible to prevent unremitting conversation between the prisoners, leading to frequent insubordination, and on occasions for days together there was a perfect babel of singing and shouting which no punishment could suppress. The hulks were gradually abandoned as accommodation was provided by the erection of permanent buildings at Pentridge, the last hulk in use being the *Sacramento*, which was availed of especially for the accommodation of prisoners close to their work at the mouth of the river Yarra. This hulk was abandoned in March, 1878.

Ticket of Leave The ticket-of-leave system, under which a convict, who, by general good conduct and assiduity at labour, was allowed at the expiration of a portion of his sentence to leave his place of confinement and to work for his own benefit under certain regulations, had been in operation in Victoria from the first. By regulations dated 13th August, 1860, the system of issuing tickets-of-leave was abolished, and absolute remission was substituted, except for prisoners convicted before 1st September, 1860.

Inspector-General. By the Statute of Gaols Amendment Act of 1871 all gaols and all hulks were from the 1st December of that year brought under the care, charge, and direction of the Inspector-General of Penal Establishments, and by the Act of 1873 all prisoners in custody under any sentence of imprisonment were placed in the legal custody of the Inspector-General.

Mark System. Except for prisoners convicted before the 1st August, 1873, all the previous regulations as to remissions were superseded by new regulations dated 16th July, 1873, introducing what is generally known as the Mark system. The Mark system remains much the same to-day as it was in 1873.

In August, 1870, a Royal Commission, consisting of Sir William Stawell, Mr. Archibald Michie, Mr. Samuel Henry Bindon, Mr. William Henry F. Mitchell, Mr. Charles McMahon, Mr. David Blair, Mr. Richard Youl, Mr. William Templeton, and Mr. Charles E. Strutt, was appointed to inquire into and report upon Prison and Penal Discipline, and it was on the recommendation of this Commission that the Mark system was introduced into the Victorian prisons as an adaptation of the Crofton system, then in operation in the prisons of Ireland.

**Gaols and
Prison
Population.**

When the Inspector-General assumed control of the Penal Department in 1871, the following Prisons were in existence :—Penridge Penal Establishment, Melbourne, Ararat, Ballarat, Beechworth, Bendigo, Castlemaine, Geelong, Maryborough, Portland, and Kilmore Gaols, and the Hulk *Sacramento*.

The Gaols at Ararat, Maryborough, Kilmore, and Portland have since been closed.

On the 31st December, 1872, the year after the Department was placed under the control of the Inspector-General, the prison population was 1,341 males and 215 females ; on 31st December, 1882, it was 1,115 males and 292 females ; on 31st December, 1892, 1,402 males and 323 females ; on 31st December, 1902, 896 males and 172 females ; and on 31st December, 1912, 683 males and 105 females.

In 1894 a Female Penitentiary was opened at Coburg, and Victoria achieved the distinction of being the only Australian Colony with a Female Prison managed by a lady governor. In 1899 a Special Division was instituted at Penridge for the treatment of hopeful cases, mainly those not previously convicted. At the same time a Restraint Division was formed for the treatment of young offenders of the larrikin type, the object being to subject them to sharp coercive treatment and to give them a distaste for prison life.

The most notable changes in the System in later years have been consequent upon the passing of the Indeterminate Sentences Act in 1908.

There are the following Prisons in existence to-day :—

Metropolitan—Penridge Penal Establishment, Female Penitentiary, Melbourne Gaol.

Country—Gaols at Ballarat, Beechworth, Bendigo, Geelong, and Sale, and the Reformatory Prison at Castlemaine.

These prisons contain accommodation for 1,561 prisoners.

In addition, there are Police Gaols at Ararat, Hamilton, Mansfield, Maryborough, Omeo, Shepparton, and Warrnambool. These latter are under the immediate control of the Police, but subject to inspection by the Inspector-General of Penal Establishments. A prisoner cannot be detained for a longer period than 30 days in a Police Gaol.

The Melbourne Gaol is the receiving prison for the metropolis, for male and female prisoners. In addition, persons confined during the Governor's pleasure, Sheriff's debtors, short sentence prisoners, persons committed for contempt of court, and prisoners transferred for medical observation from other gaols are retained here. The principal occupations are stonebreaking and the manufacture of bottle (straw) envelopes.

The Geelong Gaol is the invalid station, or hospital gaol, of the State, and receives male criminal invalids from the other gaols and from the Penridge Penal Establishment.

Beechworth Gaol receives local committals and young prisoners whom it is not thought desirable to keep at Penridge, also those who would benefit by discharge in the country away from city influences, or who are anxious to remain in the country to get work.

The Castlemaine Gaol is the reformatory prison for young and hopeful offenders sentenced under the Indeterminate Sentences Act.

The Female Prison, Coburg, receives female prisoners of any age and character from other prisons and direct from courts if sentenced to terms of three months and upwards. It consists of three Divisions, Female Prison proper, the Coburg Division, which contains the hospital and a laundry where those classified "Special" are employed, and the Jika Division, originally used for old women of the vagrant class, but now as a Reformatory Prison under the Indeterminate Sentences Act.

The other gaols have no distinctive features, merely serving as receiving places for their respective districts.

From the time of the abolition of the stockades and hulks the prison system has been centred mainly in the Pentridge Stockade, which has become the Penal Establishment of the State. The policy of centralization grew with the withdrawal of prisoners from municipal works in country districts, and it has perhaps been more emphasized in recent years, as a decreased prison population has made it possible to close or reduce in status several of the country gaols. Prisoners are transferred to Pentridge from the gaols on the warrant of the Inspector-General as authorized under the Gaols Act. It is not customary to transfer prisoners with sentences of less than six months unless they are tradesmen, or offenders requiring special treatment.

The prison reserve occupies an enclosed area of 111 acres, the outer walls having been completed in 1866. The establishment consists of five Divisions, the "A" division, which includes the Special and Restraint Divisions, the "B" division, and the "C" division. Part of the buildings of "C" division are given up to serve the purpose of a Reformatory Prison for habitual criminals under the Indeterminate Sentences Act. All prisoners on admission are

Pentridge System. placed in the "A" division to undergo a term of separate treatment. The period of separate confinement under the regulations varies from eighteen days to a maximum of six months, and is regulated according to the length of sentence, but it may be extended to nine months for misconduct. Ten days of the term of "separate" are always reserved to be undergone at the end of the sentence. Within two or three weeks of admission each prisoner is brought before the Inspector-General, who may classify him "Special," "Restraint," or "Ordinary," according to his antecedents and potentiality of reform. The "Specials" and "Restraints" are housed in "A" division, but they may be employed in other parts of the prison, where they can be kept from general association. "Restraint" prisoners whom, for their own sakes, as well as for the good of others, it is necessary or desirable to keep apart, are employed in separate labour yards, overlooked by a sentry on a raised platform. An officer, known as the Special Division Officer, devotes his whole time to looking after the Special Division prisoners and drilling the restraints.

School instruction is imparted to backward prisoners of both divisions by the Schoolmaster and Librarian. A Special Division prisoner may be reduced to the restraint, and a restraint division man showing promise may be promoted to the special. If classified "ordinary," the prisoner passes on to "B" division. A sentence of two years and upwards is represented by marks, distributed over six classes. The first class represents the term to be passed in separate treatment, and marks are allotted at the rate of 60 a week, nine on working days, and six on Sundays.

In the other classes the marks are allotted for good conduct and industry at the rate of 80 a week, twelve on working days and eight on Sundays, and the difference between 60 and 80 a week represents remission of sentence, making it possible for a prisoner to earn his discharge approximately in three-quarter time.

On attaining to the fourth class a prisoner is credited with pay at the rate of 1d. per day; he is paid 2d. per diem in the fifth class, and 4d. per diem in the sixth class. Prisoners who have passed through the classes are not on reconviction entitled to pay. The last class also carries indulgences in the shape of tea and sugar. All male prisoners receive a ration of tobacco daily, or its equivalent in money, irrespective of class. There is little or no distinction in the treatment of prisoners in the "B" and "C" divisions. The former is the more secure prison of the two. The practice is to detain prisoners in "B" division till they have earned the marks allotted to the second and third classes, and to place them in "C" division for the remaining classes. The cells of the "C" division open directly on to a court-yard, and the prisoners enjoy more liberty in the way of association and exercise than in the other divisions.

Prisoners with sentences of six months and over, but less than two years, are granted remission to the extent of one-eighth of their sentences for good conduct and industry. If well conducted they are allowed to receive one letter a month and to write one letter every three months on subjects strictly connected with themselves or their families. Visits are allowed at intervals of not less than three months.

In view of the disciplinary dangers and the moral contamination possible, the long established practice at Pentridge of allowing large numbers of prisoners to associate at meal time was abolished in 1891, and in lieu each prisoner was required to take his meals in his own cell. The same change was also made at the several gaols where it was found possible to carry it out.

Pentridge is essentially an industrial prison, and the output in the manufacture of woollen goods, blankets, serge, tweed, &c., wire netting, brooms, and brushware, boots, mats and matting, is considerable. The supplies are mainly for prison requirements and for other Government institutions. Other industries practised are carpentering, blacksmithing, basket-making, printing, bookbinding, tailoring, and tinsmithing. Pig-raising and farming operations are also carried on.

When an offender, under eighteen years of age, is convicted and sentenced to a term of imprisonment, his case is reported to the Secretary of the Neglected Children's and Reformatory Schools Department, who causes careful

**Young and
Aged
Offenders.** inquiries to be made into the offender's antecedents, and, if it is considered a suitable case for transfer to a reformatory school, the Secretary of the Department and the Inspector-General of Prisons make a joint recommendation to that effect to the Chief Secretary, and an Order in Council is issued authorizing the transfer. The offender then becomes a ward of the Reformatory Schools Department until he attains the age of eighteen years or such greater age not exceeding twenty years as the Governor-in-Council may direct.

While the young offenders are thus cared for, the aged and infirm are not overlooked. The Department causes all cases of aged and infirm prisoners

to be reported on by the Medical Officer, and, on that officer certifying that the prisoner is more fitted for a charitable institution than for treatment in gaol, a recommendation is made accordingly to the Treasurer.

A Discharged Prisoners' Aid Society was formed in 1874, for both males and females, with the object of taking hold of a prisoner on discharge from prison and endeavouring to put him or her in a fair way of earning an honest living. The Society continues a useful service to-day.

The Acts in force relating to gaols are the *Gaols Act* 1890 and the Amending Act of 1896. The Rules and Regulations are those approved by the Governor-in-Council on 16th February, 1892.

The introduction of the indeterminate sentence principle marked a new era in the prison system and in the treatment of prisoners in Victoria. The Indeterminate Sentences Act came into operation on 1st July, 1908. It is a comprehensive measure, and enables Judges to pass the indeterminate sentence

Indeterminate Sentence Methods.

not only on the habitual criminal but practically on any offender convicted of an indictable offence, and requires that prisoners while undergoing such sentence shall be detained in a reformatory prison. To meet the requirements of the Act, a portion of "C" Division of the Pentridge Penal Establishment has been proclaimed a Reformatory Prison. Here the habitual criminals and others who, on account of previous record, are considered unsuitable for Castlemaine, are detained on reaching the indeterminate stage of their sentences.

On admission, the prisoner is placed in the second grade. By good conduct and industry he may earn promotion to the first grade at the end of twelve months, or for misconduct he may be degraded to the third or penal grade. At the end of twelve months in the first grade he may be promoted to the special grade, and on completing six months in the special grade, the Indeterminate Sentences Board may make a recommendation for his release on probation. The Board may make a recommendation for release at any stage under special circumstances, and it is not obligatory to recommend release on completion of the term stated above. The ordinary prison discipline is considerably relaxed in favour of the prisoners under indeterminate sentence, and they are placed on pay and are permitted to spend portion of their earnings on approved indulgences.

To the Castlemaine prison young offenders are frequently committed direct by the courts, under indeterminate sentence; others, if considered suitable, are sent there on completion of their definite sentences. At this prison they are called "inmates." On admission the inmate is placed in the second grade, and, at the end of six months, by good conduct and industry, he may be promoted to the first grade. On completing six months in the first grade the Board may recommend release on probation. It is made a condition of release in all cases of indeterminate prisoners that they must have the assurance of immediate employment, or sufficient money to their credit to maintain them for some weeks after leaving the prison until employment is found for them. The probation extends over a period of two years, and during that time the probationer has to report himself periodically to the police at such places as may be directed.

From the time the Act came into operation until 30th June, 1913, 78 prisoners have been admitted to the Pentridge Reformatory Prison

under indeterminate sentence. Of this number, 23 are now at liberty on probation; one, for breaking the conditions of his parole, has been recommitted to the Reformatory Prison, and two, who have been reconvicted, are undergoing definite sentences, and in due course will be again placed under indeterminate detention. During the same period 69 prisoners were admitted to the Castlemaine prison under similar detention. Thirty-two have been released on probation on the Board's recommendation, and nine by special authority of His Excellency the Governor, and three have been removed to the Pentridge prison. Of those thus released three have been recommitted to the Reformatory prison, and two having been reconvicted are undergoing definite sentences in Pentridge. Of ten females who had been under indeterminate detention in the Reformatory division of the Female Prison, seven have been released on probation on the Board's recommendation, and one by special authority of His Excellency the Governor.

The Indeterminate Sentences Act provides also for the release of first offenders on recognizance by empowering the Judge of the Supreme Court or the Chairman of the Court of General Sessions or the Court of Petty Sessions before which the offender is convicted, to suspend the execution of the sentence on the offender entering into a recognizance, which may be with or without sureties and conditioned that the offender be of good behaviour for a period to be fixed by the Court, and may contain additional conditions that the offender shall be under the supervision of a probation officer, shall abstain from intoxicating liquor, shall not associate with undesirable persons or frequent undesirable places, and, generally, that he shall lead an honest and industrious life.

One of the most striking features of prison statistics during recent years has been the steady diminution in the number of prisoners.

Reduction in Prison Population. The daily average of the prison population for 1911 was the lowest on record since the prisons have been under the control of the Inspector-General, and showed a decrease of 57 per cent. on the figures for 1891.

Statistics. The attached tables show the nature of the charges for which arrests have been made, the number of prisoners in confinement, and the expenditure on police and gaols at various periods from 1871 to 1912:—

CHARGES AGAINST PERSONS ARRESTED PER 10,000 OF POPULATION, AGED FIFTEEN YEARS AND OVER, AT FIVE DECENTNIAL PERIODS, AND IN 1912.

Offences.	1871.	1881.	1891.	1901.	1911.	1912.
<i>Against the Person—</i>						
Murder and attempts at ..	.66	.30	.59	.15	.19	.20
Manslaughter ..	.33	.30	.12	.14	.07	.13
Shooting at, or wounding with intent to do bodily harm, &c. ..	1.49	1.54	1.12	1.05	.48	.41
Assaults ..	24.20	21.70	17.62	10.49	5.31	5.36
Rape and other offences against females ..	2.08	1.34	.88	1.46	1.01	.90
Unnatural offence and attempts at ..	.43	.09	.19	.16	.09	.07
Suicide, attempted ..	1.87	1.52	1.28	.72	.49	.37
Others ..	.26	.53	.28	.23	.21	.08

Charges against Persons Arrested per 10,000 of Population, &c.—*continued.*

Offences.	1871.	1881.	1891.	1901.	1911.	1912.
<i>Against Property—</i>						
Robbery, burglary, house-breaking, &c...	9.95	6.90	8.15	5.80	3.54	3.82
Horse, cattle, and sheep stealing ..	2.86	1.67	1.29	.71	.40	.41
Larceny ..	48.54	38.04	31.90	22.79	12.82	13.75
Embezzlement ..	1.02	.60	.94	.35	.18	.19
False pretences and imposing or endeavouring to impose ..	4.61	3.87	3.25	1.73	1.55	1.52
Wilful damage ..	13.74	10.28	6.73	3.96	1.59	1.64
Others ..	9.77	8.80	3.39	1.98	1.78	1.74
Forgery and offences against the currency ..	1.94	1.09	1.46	.59	.48	.34
<i>Against Good Order—</i>						
Drunkenness ..	235.79	207.95	241.61	218.98	147.72	142.89
Indecent, riotous, or offensive conduct, and obscene, threatening, or abusive language ..	26.00	75.12	67.04	53.85	29.44	29.14
Having no visible lawful means of support, begging, and vagrancy (unspecified)..	20.96	26.67	27.03	13.06	4.59	6.17
Offences against Gambling Suppression Act..	2.01	1.78	2.37	4.10	.71	1.16
Others ..	66.82	25.67	25.95	25.06	7.15	8.26
<i>Other Offences—</i>						
Perjury ..	.76	.39	.75	.42	.23	.38
Marriage and Matrimonial Causes Act (desertion of family, &c.) ..	4.11	2.82	2.82	2.37	2.08	2.23
Others ..	28.15	15.73	10.33	5.38	4.22	4.29
Total ..	508.35	454.70	457.09	375.53	226.33	225.45

PRISONERS IN CONFINEMENT, 1871 TO 1912.

Year.	Average Number of Prisoners in Confinement.			Proportion per 10,000 of Population, 15 Years and over.		
	Males.	Females.	Total.	Males.	Females.	Total.
1871 ..	1,345	274	1,619	54.77	15.46	38.30
1881 ..	1,294	304	1,598	45.25	12.35	30.03
1891 ..	1,550	350	1,900	38.78	10.07	25.43
1901 ..	951	200	1,151	23.92	5.06	14.53
1908 ..	799	98	897	18.35	2.20	10.18
1909 ..	769	115	884	17.44	2.55	9.91
1910 ..	765	111	876	17.08	2.43	9.68
1911 ..	713	100	813	15.73	2.16	8.87
1912 ..	726	112	838	15.56	2.35	8.88

EXPENDITURE ON POLICE AND GAOLS, 1871-2 TO 1911-12.

Amount Expended (exclusive of Pensions) on—

Year.	Buildings.				Total.	Amount per Head of Population.
	Police.	Gaols and Penal Es-tablishments.	Police.	Gaols and Penal Es-tablishments.		
1871-2	190,711	57,855	5,722	2,133	256,421	6 10
1881-2	201,063	53,032	14,996	3,328	272,419	6 2
1891-2	283,409	65,679	19,113	23,319	391,520	6 9
1901-2	271,561	51,948	7,064	3,613	334,186	5 6
1907-8	281,751	49,645	9,713	1,654	342,763	5 5
1908-9	282,044	49,025	10,117	1,708	342,894	5 5
1909-10	293,846	49,869	10,448	2,139	356,302	5 6
1910-11	308,676	48,706	11,987	1,691	371,060	5 8
1911-12	316,456	48,514	12,856	2,300	380,126	5 8





PARLIAMENT HOUSE, MELBOURNE.

CLOSER SETTLEMENT IN VICTORIA.

By F. E. Lee, Member of the Lands Purchase and Management Board.

The initiation of the policy of closer settlement upon land repurchased and subdivided by the State dates back only to the year 1898. The Government of that time passed an Amending Land Act, of which Part IV. related to the purchase by the State of privately-owned land for purposes of closer settlement. Under the provisions of this Act, authority was given to acquire suitable land, each purchase being submitted to Parliament for ratification.

Initial Legislation. The value of land which might be held by a closer settlement lessee was limited to £1,000, which limit, however, was subsequently increased to £1,250. Residence upon the allotment for at least eight months in each year, and improvements to the value of 10 per cent. of the capital value of the land by the end of the third year, and a further 10 per cent. by the end of the sixth year, were compulsory conditions of the lease. At the expiration of six years from the date of the lease, and upon payment of the balance of the purchase money, the Crown Grant was issued, and carried no further restrictive conditions.

Power was also given under this measure to repurchase and subdivide land suitable for the purpose of establishing homes for working men within easy distance of the scene of their employment.

It was not until 1904 that accumulated experience and an increased demand for land dictated an extension of the principle of closer settlement, and a modification of the terms and conditions, whereby those in search of farm lands or suburban homes could find their wants supplied. Parliament recognized that the responsible duties of the Minister for Lands precluded him from giving the requisite personal attention to the acquisition, subdivision, and settlement of repurchased lands, hence the passing of the first Closer Settlement Act in 1904, which placed the administration of the measure in the hands of a Board of three members, who advised the Minister in all matters of detail.

Under this more comprehensive Act a decided impetus was given to closer settlement, and the Board was enabled, from the numerous properties submitted, to select and subdivide a number of suitable estates, which were rapidly disposed of as soon as made available.

Minor amendments of the 1904 Act were made from time to time, till in 1910 it was decided to extend a greater measure of financial assistance to settlers, both upon closer settlement areas and upon Crown lands, and to liberalize other sections of the former measure.

The Act of 1910, while retaining administration by a Board of three members, responsible to the Minister, made it necessary for the Board to give its exclusive attention to the closer settlement policy.

Amongst many other important innovations, the Act of 1910 foreshadowed the regeneration of irrigation settlement, and wide powers were given under it for the development of farm lands coincident with settlement. A sum of £200,000 per annum was set aside to provide financial assistance to settlers who desired to avail themselves of it, the security being 60 per cent. of the value of the permanent improvements effected by the lessee or licensee in the case of Crown lands. The value of land which a settler might hold under

conditional purchase lease was increased from £1,500 to £2,500, and, in the case of a homestead area carrying extensive improvements, to £4,000.

Workmen and agricultural labourers were also provided for, and authority was given to assist in the erection of dwellings for them.

The administration of the Wire Netting Act, whereunder Crown tenants were enabled to obtain wire netting upon easy terms, with a rebate where their holdings adjoined unoccupied Crown lands, was handed over to the Board. Power was given to investigate all cases submitted to the Board in which a provisional agreement to sell and purchase land had been entered into by two or more private persons. If, after obtaining valuations, the Board was of opinion that the circumstances warranted purchase, the vendor was bought out, and the purchaser became a lessee under the Closer Settlement Act, and liable to all its conditions.



TYPICAL GIPPSLAND HILL COUNTRY.

Amendments of the Act in 1912 liberalized the powers of transfer of working men's and agricultural labourers' allotments, and increased the value of the land which could be held under the sections relating thereto, and also provided for the necessities of settlers in other directions. The Act, as it stands to-day, may fairly be regarded as an example of progressive legislation, founded on matured experience and knowledge of local conditions, and offers every reasonable facility for a lessee to permanently establish himself and his family in comfort and prosperity.

The Closer Settlement Act, as has been stated, is administered by a Board of three members, known as the Lands Purchase and Management Board.

Administration. assisted by a permanent secretary and the general clerical staff of the Lands Department. The scope of the Board's activities is a wide one. The inspection, valuation, purchase, subdivision, and settlement of repurchased lands is a preliminary only to the successful

establishment of settlers. While it is customary for a new settler to work out his own salvation, the Board exercises a friendly guidance, when called on to do so, especially during the earlier years of settlement.

Where application for financial assistance is made, the Board obtains a prompt report and a valuation of the improvements, and no effort is spared to assist the settler and at the same time safeguard the interests of the State.

The estates are regularly visited by the Board members, and all matters requiring attention are promptly brought under notice and attended to as speedily as opportunity permits.

The Board is required by the Act to present an annual report to Parliament, in which the position of the closer settlement scheme, the amount of advances made, the financial obligations of lessees, the receipts, and the expenditure incurred and income received, are clearly set out. These various statutory returns and the balance-sheet enable the Government from year to year to acquaint the country with the actual progress or otherwise of the closer settlement policy. Whilst wide discretionary powers are vested in the Board, all matters of policy are first approved by the Minister after consultation with his colleagues in Cabinet.

Up to the present time there has been no lack of suitable land offering for closer settlement purposes. So wide has been the choice that, except in one case, the provisions of the compulsory purchase clause have not been required to be put into operation. It is customary, when an area of land is submitted at a price which will permit of subdivision into sufficiently large holdings, for the Board to recommend the Minister to obtain a pre-

Method of Purchase of Land. preliminary report and valuation. If the report thus obtained is generally favorable as regards the soil and other conditions, the members make a personal inspection in order to form an idea

of the prospects of successful settlement in the locality. After a full consideration of the whole of the facts, if it is decided that the area can be successfully settled, further reports and valuations are obtained from two independent valuers. In the event of an unfavorable opinion being formed of the prospects of settlement, the Minister is advised to decline the offer. It is not unusual for the Board, upon the reports obtained, to arrive at a price below the vendor's offer, in which case negotiations to purchase ensue, and these may be terminated by the vendor refusing to resubmit at a lower figure. Upon acceptance of the Board's offer, a contract of sale is entered into, and the terms and conditions of purchase, date of possession, and all other necessary details are arranged for. The vendor is asked to submit his title to the Crown Solicitor, and, upon the transfer to the State being executed, payment is made upon the terms agreed on. It is not uncommon for the vendor to be required to discharge a mortgage or other encumbrance before transfer. The Board reserves the right to refuse to take over mortgages which have more than two years to run, or carry more than 4 per cent. interest.

The vendor is required to pay all taxes, municipal rates, &c., up to the date of transfer, and between the dates of acceptance of the Board's offer and transfer of title he must insure all buildings, &c., to the value placed thereon by the Board.

The terms of the contract of sale ordinarily provide for entry on the land by the Board or its officers prior to the date of possession, for survey, subdivision, or any other necessary purpose.

**Subdivision
and Allotment
Valuation.**

The Surveyor-General is requested to furnish a design of subdivision, the reports and valuations obtained being placed at his disposal. After the preliminary design is approved and boundaries are defined, the Board fixes the price per acre of each holding. Before the allotment values are fixed, a financial statement of the estate, including cost of purchase, survey and other fees, loss of land in roads or for other purposes, and an amount to cover the cost of construction of roads, bridges, drains, &c., is made out, and all portions of the estate are made to carry a proportionate share of the total cost.



THE COMBINED HARVESTER AT WORK.

It is usual to consult the local municipal authorities regarding the closing of existing roads if such is required, and to obtain from the local municipal engineer an estimate of cost of road construction, before the subdivisional plan and allotment values of an estate are made public.

The Closer Settlement Act provides that, where, after purchase of an estate, it is found necessary for purposes of subdivision to open new roads, construct bridges, culverts, drains, &c., the Board shall provide one-half the

**Assistance by
the Board
towards Road
Construction,
&c.** total cost of such works within the boundaries of the estate, and the local municipality shall provide the remainder. If for any reason it is not convenient for a municipality to find its quota, the Board may loan them their moiety upon terms and conditions to be mutually agreed upon. In this way new settlers need not be hampered during the early days of settlement by having to cart produce over unmade roads within the estate they are residing on. In regard to road improvement outside the boundaries of an estate, settlers are in the position of other ratepayers, and make their

representations direct to the municipal authorities. Where two municipalities are concerned in the carrying out of public works, the Board still provides one half of the cost and the municipalities concerned are jointly responsible for the remainder.

It is the usual practice to advertise widely that allotments upon any estate are available till a given date, usually three to four weeks ahead, and all applications lodged by then are deemed to have been made simultaneously. Subdivisional plans, with the prices of all

Method of Selection of Settlers. allotments, amount of deposit and fees required, and a brief reference to some of the principal conditions of the Act, are widely distributed.

All applicants are advised to inspect the land personally before lodging an application. Railway tickets at considerably reduced rates may be obtained from the Secretary of the Board, in order that inspection may be made.



BUILDING A HAYSTACK WITH ELEVATOR.

A local Land Board meeting is held on the date advertised, invariably in the town nearest to the estate, at which all applicants are requested to attend and give evidence in support of their applications. Each applicant is called upon to make a declaration in regard to his assets of cash, stock, and plant, his experience, family responsibilities, &c., and the officer presiding over the Board makes a recommendation in accordance with the evidence submitted. Each applicant is asked to make a choice of a number of allotments in order of preference, and, should he not be successful in his first choice, he may reasonably expect to succeed in one of his subsequent selections. An applicant is rejected if his assets or experience are not, in the opinion of the Board, sufficient to enable him to command success.

Experience has shown that this method of selection is more satisfactory than a system of choice by ballot. Each applicant has an equal opportunity of securing a picked portion of an estate, if his assets warrant it, and each person applying has more than one chance to secure an allotment.

Unsuccessful applicants have the right of appeal from the recommendations of the presiding officer of the local Land Board, in which case the Closer Settlement Board hears the appeal and takes sworn evidence from the appellant. The decision of the latter Board is final. The deposits lodged by unsuccessful applicants are returned, less deduction of registration fee of 5s.

Successful applicants are notified immediately after approval by the Board, and a "permit to occupy" the land granted to them is forwarded. Their liability commences from the date of the "permit." A "permit" is looked upon as an interim lease pending the issue of a conditional purchase lease at a later date.

The maximum value of land, except in the case of a homestead allotment, allowed to be held by a closer settlement lessee, is £2,500. A deposit of 3 per cent. of the capital value of the land, together with £1 5s. lease and registration fees, must be lodged with the application. The deposit

Terms and Conditions of Payment. is regarded as a payment off principal, and is deducted from the capital value of the land. The instalments, amounting to 3 per cent. of the balance of the capital value, are payable every six months from the date of occupation, over a term of $31\frac{1}{2}$ years. The annual payment of 6 per cent. of the capital value is made up of $4\frac{1}{2}$ per cent. interest and $1\frac{1}{2}$ per cent. principal. A lessee may at any half-yearly period pay any sum off the principal, and thereby reduce his annual instalment at will.

During the first six years of the lease of a farm allotment a lessee has no power to transfer, sublet, or mortgage the land. He is required to obtain a certificate of compliance at the end of the first, third, and sixth years that the covenants of his lease have been observed, and that he has effected permanent and substantial improvements to the amounts of 6, 10, and 20 per cent. of the capital value of the land for each period respectively. No transfer after six years is allowed until the necessary certificate of compliance has been obtained.

After the expiration of twelve years from the date of the lease the Crown grant may be obtained upon payment of the balance of the purchase money. The residence conditions by the occupier of the land for the time being are continued after the issue of the Crown grant.

During the first six years of his lease, if a lessee so desires, he may, with the Board's consent, surrender in favour of an eligible and approved person, who is willing to purchase his improvements from him and become a lessee in his stead, the new lease dating from the date of surrender.

In the event of the outgoing lessee being in arrears with his payments to the Board, all moneys have to be paid through the Board before the surrender is approved.

After six years a transferee is credited with all the residence period put in by his predecessor, and may re-transfer at any time to an approved person conditionally on his obligations to the Board being met. Any unpaid advances due by an outgoing lessee must be taken over by his successor unless otherwise arranged for.

In the case of a deceased estate, the next of kin may take out letters of administration, or the executors may within a period of twelve months transfer the property to an eligible person, after all payments to the Board are met.

In the case of an assigned estate, the assignee has power to dispose of the property within twelve months upon payment of all arrears due. The Board has power to call on a lessee at any time to show cause why his allotment should not be forfeited if any of the covenants of the lease have not been observed. Recovery of amounts due may be made by distress warrant, or, in the event of abandonment of the allotment, by ordinary civil process.

In the event of the abandonment of an allotment, the lessee forfeits any equity he may have therein, and, upon cancellation of his lease, the holding is again made available for general application. There is no accumulation of arrears of instalments loaded on to a forfeited or abandoned allotment.

Parliament has indicated through the Closer Settlement Acts its belief that permanent residence is a fundamental factor in successful settlement. Personal residence by the lessee or any member of his family over the age of eighteen years, is mandatory for a period of eight months in each year, and any breach of this condition renders the lease liable to



A CLOSER SETTLEMENT FARM.

forfeiture. Residence upon the allotment, or upon any portion of a closer settlement estate, or upon land not separated from the allotment by more than a road or water-course, is deemed to be sufficient compliance. This enables several members of a family to hold allotments on the same estate, and jointly occupy one residence. It also affords opportunity for landholders adjoining the estate, who may be eligible themselves or through the members of their family, to obtain a closer settlement allotment without breaking up the family home. The most recent legislation permits an applicant for closer settlement land to nominate at the time of application some approved person to fulfil the residence condition on his behalf during the first three years of the lease. By this means a lessee is enabled to secure a holding, and cause it to be developed before he is required to comply with the conditions of the lease himself.

Residence Conditions.

Prior to 1907 settlers were unable to obtain any advances from the Board on the security of their improvements, and consequently, after an unpropitious season, it was in some cases difficult for them to promptly meet their engagements to the Board. Moreover, the proper development of the land was retarded by the settlers' inability to finance at critical periods.

**Advances to
Settlers.**

To overcome this disability section 4 of the Closer Settlement Act 1907 provides that an advance, up to 60 per cent. of the value of the permanent improvements effected, may be made to any lessee. Section 86 of the Closer Settlement Act 1909 (No. 2) extends similar assistance to the licensees of Crown lands during the first six years of their occupancy. A sum of £200,000 is fixed by the Act for advances to settlers each year, and the maximum advance obtainable by any lessee is £500.



SCENE ON A DAIRY FARM.

All advances made under this section carry 5 per cent. interest, and are repayable half-yearly over a term agreed upon not exceeding twenty years. The repayment of advances made is quite apart from the instalments on the land, and, until paid off, the debt remains a charge on the land and the lessees' interest therein.

Lessees obtaining advances on the security of improvements are required to insure the buildings and fencing in the joint names of the Secretary of the Board and themselves, for the amount of the advance; the premiums are paid by the lessee. The lessee may insure with the Board or with any approved insurance company at option.

It is not an unusual occurrence for the Board to be asked to suspend for a short term, say, till after harvest, one or more instalments due on the land against the security of the improvements, the lessee paying 5 per cent. for the accommodation.

It may be stated that permanent improvements are defined as buildings of all kinds, fencing, clearing away timber or stone, water storage, drainage, or any other improvement of a substantial character which adds to the value of the land. Where an advance is made for grading land prior to irrigation, or towards purchase of live stock, the advance is repayable over a much shorter term.

It is worthy of note that the Closer Settlement Board itself insures improvements for tenants of closer settlement and Crown lands, where it is necessary to effect such insurance. Insurance with the **Insurance of Improvements.** Board is not compulsory, but there are good reasons why the settler should adopt this course, and lessees are gradually doing so.

A sum of £10,000 is provided for the Insurance Fund by the State Treasurer, and, as the scope of the Board's insurance widens, this undertaking will become self-supporting.

Under the Act a working man may obtain an allotment of land to the value of £250. The Board provides an amount of £250 for the purpose of erecting a dwelling, and the lessee himself must provide £50. The payments amount to 6 per cent. annually on the capital value of the land over 31½ years, and 8 per cent. on the amount of the advance, both principal and interest being repayable over twenty years.

Working Men's Homes and Agricultural Labourers' Allotments. Lessees may either obtain designs, plans, and specifications of suitable buildings through the Board's architect, to whom a small fee is payable; or they may submit their own plans for approval. Contracts are entered into with builders for the erection of the dwelling, after the lessee has deposited with the Board the difference between the contract price and the £250 provided.

Upon all estates set aside for working men's homes the Board arranges with the local municipality to construct roads, channels, and footpaths, to plant trees, &c., out of the amount loaded on the estate for the purpose. Water, gas, and sewerage mains are usually arranged to be laid prior to the making of the streets, so that lessees are under no inconvenience in these necessary matters.

In the case of agricultural labourers' allotments, the value of the land which may be held is £350, but the amount of assistance for the erection of dwellings is limited to £50.

Provision has been made in nearly every subdivision of country lands, for a number of agricultural labourers' allotments, in order that farm labourers may be encouraged to remain in close proximity to their work, and at the same time acquire homes for themselves upon easy terms.

Houses for clerks and artisans are also erected by the Board upon special terms.

In order that a broad view of the results of closer settlement since its inception may be obtained, the following summarized figures **Summary of Closer Settlement up to date.** are taken from the report of the Lands Purchase Board presented to Parliament for the year ended 30th June, 1913:—

Land acquired and made available for settlement as dry and irrigable farms, agricultural labourers' allotments, working men's homes, township sites, &c.	532,115 acres
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Land purchased but not yet made available, including irrigation land	31,439 acres
Total cost of repurchased land	£4,184,447 13s. 11d.
Expenses incidental to survey, subdivision, and disposal of land made available	£55,611 7s. 4d.
Improvements and public works	£75,246 6s. 4d.
Reserve for further public works	£51,828 13s. 1d.
Value of land disposed of under the Closer Settlement Acts for all purposes	£3,477,254 11s. 8d.
Value of land on hand still to be disposed of ..	£586,627 4s. 2d.
Value of land not yet made available	£327,810 2s. 9d.
Number of lessees in occupation of farm allot- ments	2,805
Number of lessees in occupation of workmen's homes	840
Number of lessees in occupation of agricultural labourers' allotments	261
Total area of farm allotments	498,701 acres
,, " " workmen's homes	512 "
,, " " agricultural labourers' allotments ..	3,658 "
,, " " township allotments	3,564 "
,, " set apart as roads and reserves	6,994 "
Value of permanent improvements effected by lessees	£910,542
Value of live stock, the property of lessees ..	£527,010
Area under cultivation	137,466 acres
Amount of principal and interest due on land repaid by lessees	£922,842 1s. 7d.
Amount of principal and interest due on land owing by lessees	£143,153 12s. 11d.
Amount advanced to closer settlement lessees to effect improvements	£203,094 10s. 11d.
Amount of principal and interest repaid on advances	£34,021 4s. 6d.
Amount advanced to Crown licensees to effect improvements	£116,476
Value of wire netting supplied	£13,692

The above extracts from the Board's last report are sufficient to illustrate the magnitude of the closer settlement operations. It is estimated that there is a resident population of 15,607 souls upon the areas under control of the Board, and this fact alone is sufficient to entirely justify the State in its efforts to establish people upon the land, under conditions which enable them to work out their own salvation at no eventual cost to the community at large. It is to be expected that, as the agricultural conditions of the State gradually undergo a change, experience will dictate further modifications of the Closer Settlement Acts to meet the alterations.

In conclusion, it may be remarked that there is one factor in closer settlement, as in every other undertaking in life, which counts more towards ultimate success than most others, and that is the personality of the individual.

The successful lessees are to be found widely distributed throughout the closer settlement estates in Victoria, and evidences of their industry and thrift manifest themselves in comfortable dwellings and well cared for live stock and plant. These settlers set an example which their less experienced or less fortunate neighbours are not slow to emulate, so that it is not unreasonable to anticipate that in course of time modern farming methods, coupled with patience and industry, will lift closer settlement to a higher plane and make the areas, as they should rightly be, the pride of the State.



IRRIGATION IN VICTORIA.

By Elwood Mead, M.S., Dr. Engineering.

Victoria was the first of the Australian States to undertake irrigation on a large scale. The Goulburn Scheme, the largest of the State works, was begun in 1887, and construction on this and other Government irrigation works has been proceeded with continuously ever since. The principal dimensions of the main works of the Goulburn Scheme are :—

GOULBURN WEIR.

Length of crest	925 feet
Height	50 feet
Area submerged	5,000 acres
Holding capacity	20,000 acre-feet of water
Cost	£235,000
Contract signed	April, 1887
Work completed	July, 1891

WESTERN MAIN CHANNEL.

1st Section.—Goulburn Weir to Waranga Basin.

Length	23 miles
Width on bottom	110 feet
Width on top water line	131 feet
Depth of water	7 feet
Grade	6 inches per mile
Carrying capacity	1,717 cubic feet per second, or 3,434 acre-feet per day
Cost	£247,000

2nd Section.—Waranga Basin to Serpentine Creek.

Length	92 miles
Carrying capacity—	
(a) At off-take	1,000 cubic feet per second
(b) At Serpentine Creek	200 cubic feet per second
Cost	£432,000

WARANGA BASIN.

Length of embankment	22,539 feet, equal to 4½ miles
Maximum height	29 feet
Width of base	137 feet
Width of crest	8 feet
Maximum depth in the storage	27 feet 8 inches
Area submerged	19½ square miles
Storage capacity	197,000 acre-feet of water
Cost	£251,000

NOTE.—The first section of the Western Main Channel will fill the reservoir in 60 days.

EASTERN MAIN CHANNEL.

Length	..	..	33 miles
Width on bottom at off-take	..	..	20 feet
Width on top water-line at off-take	..	..	41 feet
Depth at off-take	..	..	7 feet
Grade ..	..	..	6 inches per mile
Carrying capacity	..	..	333 cubic feet per second, or 666 acre-feet of water per day
Cost	..	..	£128,000

The average annual discharge of the Goulburn River is about 2,000,000 acre-feet per year. The area of land commanded and suited to intense culture is between 600,000 and 700,000 acres.

PROGRESS IN FOUR YEARS.

In the four years which have elapsed since closer settlement began, the irrigated area has increased by 65,040 acres, or 80 per cent. In the two years preceding, irrigation was on the decline. The increase in the different districts having allotted water rights are shown in the following table :—

Name of District		Acres irrigated, 1909-10.	Acres irrigated, 1912-13.	Increase in Acres.
Shepparton	..	None	4,346	4,346
Rodney	..	32,356	38,611	6,255
Tongala	..	2,270	4,955	2,685
Rochester	..	500	7,769	7,269
Dingee	..	None	92	92
Bacchus Marsh	..	31	1,858	1,827
Cohuna	..	19,825	26,884	7,059
Tragowel Plains	..	20,000	38,103	18,103
Koondrook	..	5,029	14,405	9,376
Merbein	..	202	4,993	4,791
Nyah	..	569	1,569	1,000
Swan Hill	..	5,410	7,647	2,237
Totals ..	..	86,192	151,232	65,040

The Coliban Scheme, with its reservoirs at Coliban and Malmsbury, supplies the city of Bendigo and a large area of orchards and market gardens between Castlemaine and Bendigo, while lower down on the Loddon the Laanecoorie Basin, with the works of the Tragowel and Boort districts, irrigates 20,000 acres.

In the southern part of the State the Werribee Scheme provides water for 3,500 acres at Bacchus Marsh and 6,000 acres at Werribee. The fertility of these two districts and their proximity to Melbourne have given the land exceptional value. Land at Bacchus Marsh has sold for over £100 an acre, and has rented for £5 an acre per year. The Werribee lands promise to reach an equal value as soon as they are equally developed. At present these lands are being sold by the State at from £25 to £29 per acre.

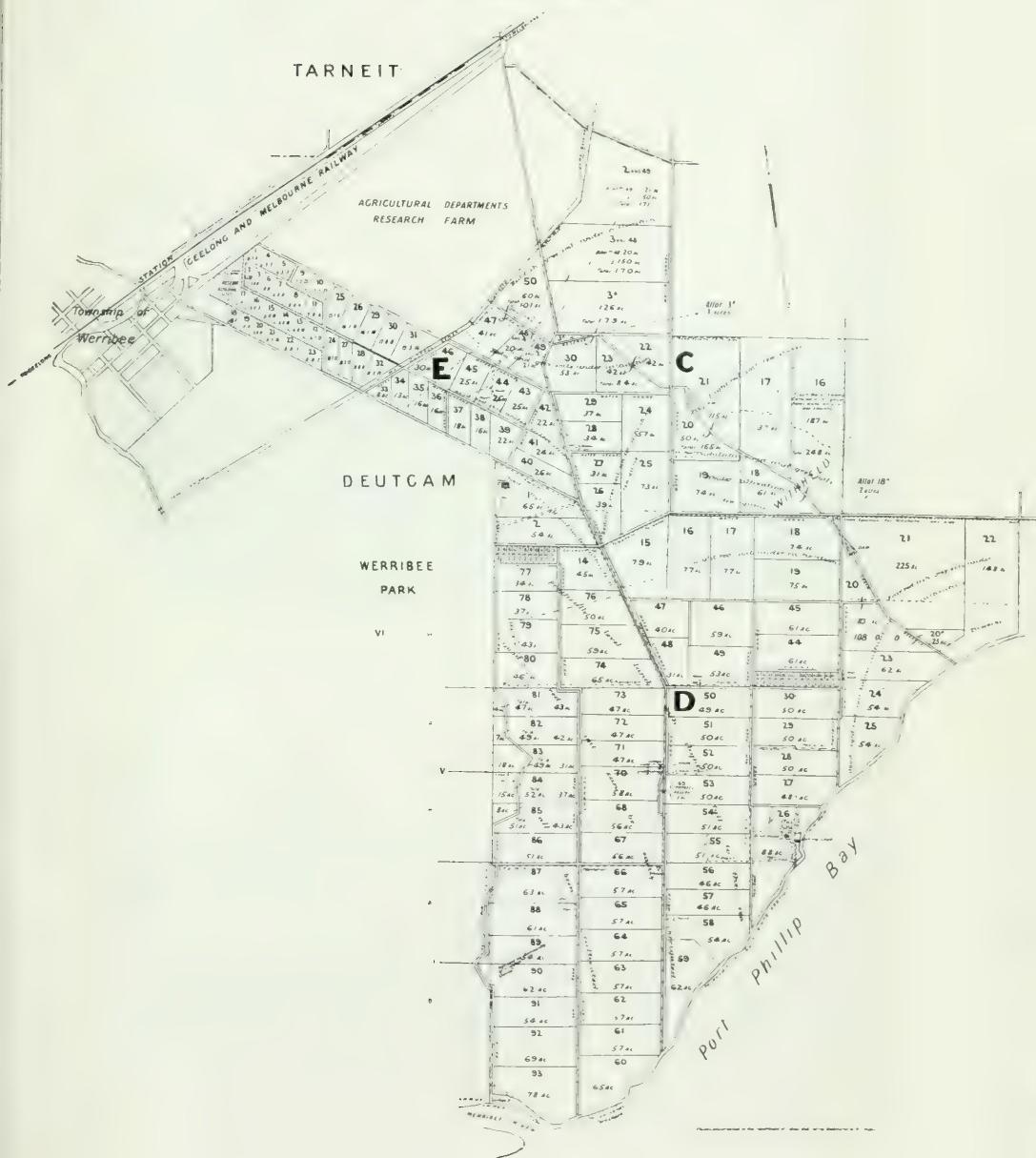
The works now completed, or in process of construction, will irrigate in all 400,000 acres, and of these 250,000 acres were irrigated last year.

IRRIGATION ALLOTMENTS
(AND DRY FARMS)
WERRIEBEE ESTATE

ACQUIRED UNDER CLOSER SETTLEMENT ACTS 1904

— COUNTY OF BOURKE —

SCALE OF FARMS



In addition to these irrigation works the State has constructed an extensive system of channels for supplying the farms of the north-western part of the State with water for domestic and stock purposes. In some instances there is also water enough to provide for the irrigation of small areas of land. This system of channels provides a domestic and stock water supply to 13,000,000 acres. The whole of the works to supply water for irrigation and domestic and stock purposes have cost £7,750,000.

A considerable amount of irrigation is carried out by private land-owners along the Murray and on the river flats in Gippsland; and this season the sugar-beet and lucerne lands of the closer settlement at Maffra are being irrigated. The depth and fertility of the soil of the Gippsland river flats makes it certain that they will give good returns under irrigation, and, if irrigation is combined with closer settlement, there is no doubt it will result in the creation of rich and prosperous communities.



TWO WEEKS' GROWTH OF LUCERNE AT ROCHESTER.

ADVANTAGES OF IRRIGATION.

With irrigation, the mild climate of Victoria, which is free alike from extremes of heat and cold, enables a wide range of high-priced products to be grown. With irrigation, there is no dead season in the year, and there is scarcely a month when crops can not be seeded or harvested. With irrigation, two farm crops can be grown in the year, a wheat crop in the winter, and a maize crop in summer. With irrigation, from four to six cuttings of lucerne can be harvested in the year, and the dairyman can have green feed through the summer months and a continuous milking season. With irrigation, the orchards will produce everything from olives to apples; oranges, pears, and peaches grow on the same acre; all grow to perfection, and give an acreage return that enables men to make a comfortable living off 10 to 20 acres of land. At Mildura, the oldest of the fruit settlements, 6,000 people are being maintained by the produce of 12,000 acres, and there are many other large areas which will in the near future support one person to every 2 acres. Last year the products of the Mildura district were worth nearly £400,000.

A 10-acre orange grove will bring a larger return than a 300-acre wheat field, and one acre of lucerne will fatten more sheep than 20 acres of native grass. Irrigation will, therefore, multiply the population, which would otherwise be supported on the land, 10 to 100 times, and give a corresponding increase in the value of products. Furthermore, an irrigation district is freed from the vicissitudes and losses that come with recurring years of drought, and a densely peopled area has better home conditions and more attractive social life than sparsely settled areas dependent on the scanty rainfall of the north.

THE DIFFERENCE BETWEEN IRRIGATED AGRICULTURE AND AGRICULTURE DEPENDENT ON RAIN.

As nearly all the irrigable land was settled and cultivated before irrigation works were built, the tendency of land-owners has been to continue under irrigation the farming methods they had practised when all moisture came from rain. Wheat and native grasses are retained as the principal farm products, and lucerne where grown has been mainly to provide pasture. The greatest problem of irrigation development has been, therefore, to secure the adoption of a different system of farming, so as to provide for a succession of fodder crops throughout the season, thus enabling farmers to increase the carrying capacity of the land many times beyond what is possible without irrigation. Although progress in this direction was slow at first, it has been quite marked in the last two or three years; and a climate, which makes it possible to plant crops every month of the year, gives great opportunities to the irrigation farmer who combines stock-raising with farming.



IRRIGATION PUMPING PLANT AND FARM FERRY.

List of Fodders and Dates of Planting in the Irrigation Districts.

Name.	Quantity of Seed to be used per acre.	Time of Planting.	Remarks.
Oats (green fodder)	1 $\frac{3}{4}$ to 2 $\frac{1}{2}$ bushels	All months in the year ..	Oats can be sown any time provided the soil has sufficient moisture to cause the seeds to germinate; when soil is dry irrigation and cultivation before planting is good practice.
Sugar Beets	12 to 15 lbs.	July to September ..	Planted in rows 20 inches apart and thinned when the plants show two leaves, leaving one beet at intervals of from 9 to 12 inches. Field must be kept clean during the growing season. Excellent feed for pigs and cattle.
Luzerne (Spring)	10 to 15 lbs.	August and September ..	On heavy soils 1 bushel of oats may be used with the lucerne, but on friable soil this practice is not to be recommended.
Paspalum	Roots are planted instead of seed ..	August and September ..	The roots are planted about 1 yard apart, there being 5,000 roots per acre. This grass should only be planted in heavy or swampy lands which are difficult to cultivate.
Sorghum	10 to 12 lbs.	September to December ..	Usually sown broadcast, and if planted early can be grazed down more than once.
Ambrocane	10 to 12 lbs.	September to December ..	Ambrocane is a good fodder to grow on heavy soils, usually giving heavy yields.
Maize (in rows) ..	$\frac{3}{4}$ to 1 bushel ..	15th September to 1st February ..	Whenever possible, maize should be planted in rows about 3 feet apart in order that the crop may be cultivated and irrigated in furrows. Flat red and yellow dent are good varieties.
Pumpkins	Plant 10 feet x 10 feet, four seeds per hill ..	October ..	Pumpkins are often suitable, but make excellent stock feed, particularly suitable for pigs. They are also good feed for cows if pigs are not kept. "Ironhark" is a good variety.
Pie or citron melons	Plant 10 feet x 10 feet, eight seeds per hill ..	October ..	Similar to pumpkins for feed. Plough the land in ridges 10 feet apart, put one bucketful of stable manure in each hole, and cover with 3 inches of soil, upon which seeds are deposited and covered with 2 inches of soil.
Millet	10 to 15 lbs.	October to January ..	When millet is planted early and irrigated regularly, the crop can often be grazed down three times during the growing season.
Barley	1 $\frac{1}{2}$ to 2 $\frac{1}{2}$ bushels ..	March, April, and May ..	Use Cape barley.
Mangels	4 to 8 lbs. ..	March or September ..	Soak seeds for 24 hours previous to planting and keep well cultivated.

List of Folders, etc., continued.

Name.	Quantity of Seed to be used per acre.	Time of Planting.	Remarks.
<u>Mixed Fodders—</u>			
1 bush. Algerian oats	2 bushels ..	March, April, and May ..	Tares and oats to be sown with seed drill, and peas broadcasted.
1 bush. dun peas	1 1/2 bushels ..	March and April ..	Barley sown with seed drill, and rye sown with manure. Best results when sown early in March, conditions being favorable.
1 1/2 lbs. tares ..	1 1/2 bushels ..	March, April, to 15th May ..	Use Algerian oats.
1 1/2 bush. barley	2 bushels ..	March, April, to 15th May ..	Use Cape barley.
3 lbs. rape ..	2 bushels ..	March, April, to 15th May ..	Use Algerian oats and Cape barley. The oats, barley, rye, and tares may be mixed and sown with seed drill, and peas broadcasted. Plant while the ground is warm and when moisture conditions are sufficient to start the growth.
1 1/2 bush. oats ..	2 1/4 bushels ..	March, April, and May ..	Use Cape barley.
1 1/2 bush. barley	2 bushels ..	March, April, and May ..	Algerian.
1 1/2 bush. rye ..	2 bushels ..	March, April, and May ..	General practice proves that the planting should take place in April or May, the time to be determined when the first autumn rains occur.
1 1/2 bush. tares ..	2 bushels ..	March, April, and May ..	
1 1/2 bush. rye ..	2 bushels ..	March, April, and May ..	
1 1/2 bush. peas ..	4 to 6 lbs. rape ..	March to April ..	
1 1/2 bush. barley	1 to 2 lbs. mustard ..	March to July ..	
7 lbs. tares ..	1 1/2 to 2 bushels ..	April and May ..	
Rape and mustard (mixed)	1 1/4 to 2 1/2 bushels ..	April and May ..	
Rye ..	10 to 15 lbs. ..	April and May ..	
Dates (hay) ..	..	..
Lucerne (Autumn) ..	..	..

Note.—When fodders are grown with irrigation, sufficient seeds should be sown to insure a heavy growth and no bare patches, as water can be applied at times and in quantities required. Too often allowance is not made for part of the seed not germinating, the result being a scanty stand. Judgment should be used and the quantities of seed to be sown per acre varied to meet the conditions. Where land is free, friable, and rich, and has been well tilled to form a good seed bed, containing sufficient moisture, the conditions are ideal, and it is probable that a great percentage of the seeds will germinate. Where the land is not so adaptable and the time of sowing is late, and the ground cold, more seed should be used. In all except virgin soils not less than 100 lbs. of some fertilizer should be sown with every fodder crop. Superphosphate, guano, Thomas' phosphate, and a mixture of bone-dust and superphosphate are each in common use and will give good results.

CLOSER SETTLEMENT ESSENTIAL TO SUCCESSFUL IRRIGATION DEVELOPMENT.

Intense culture is essential to the best results under irrigation. This requires far more labour on a given area than can be profitably employed in agriculture dependent on the rainfall of this State. Irrigation development therefore, requires either closer settlement or the employment by land-owners of much hired labour. The Government of Victoria decided that it was better to have small holdings with each farmer working for himself and getting the full rewards of production than to have large farms cultivated by a more or less migratory population working for wages; and about five years ago, in accordance with this policy, the State made closer settlement and intense culture the basis of future irrigation development.

In order to bring this about the State has bought from private owners over 100,000 acres of land, of which 60,000 acres have been settled, and the remainder is being prepared for settlers. Since this work started the applications for small irrigation allotments have averaged about 225 a year. The

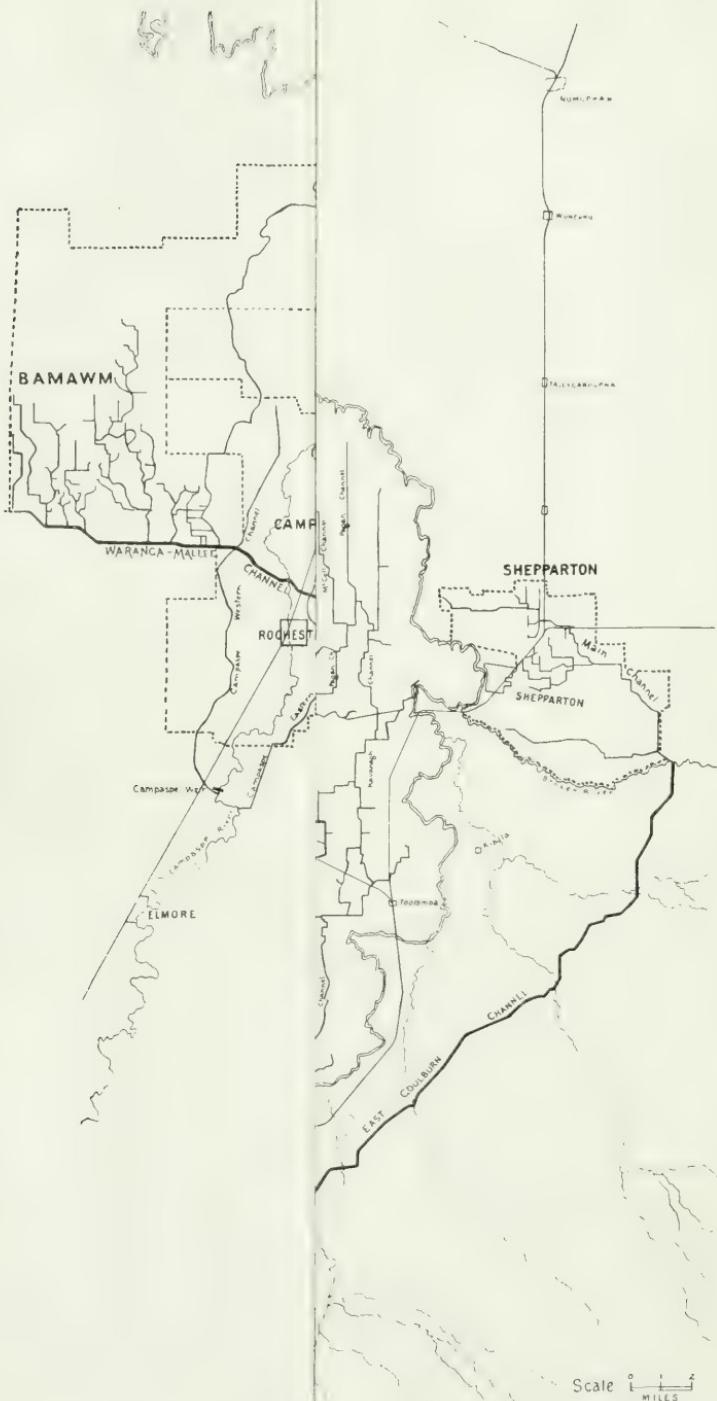


AFTER THIRD YEAR OF SETTLEMENT AT SHEPPARTON.

State permits settlers to take land to the value of £2,500 if it is unimproved, and up to £4,000 in value if it has a house or other valuable improvements. It provides blocks for farm labourers varying in size from 2 to 5 acres, which are scattered throughout the irrigation districts, and enable the owner to keep a cow and poultry, grow all his fruits and vegetables, and thereby greatly to reduce his living expenses. This policy has proved a neighbourhood convenience by keeping farm labourers in districts where previously they were migratory. The usual size of fruit blocks is from 20 to 40 acres, and of dairying and mixed farming blocks from 30 to 200 acres.

STATE AID TO SETTLERS.

The State erects houses for settlers on their paying a deposit varying from 10 to 30 per cent. of the cost. Up to the date of this article about 450 houses have been built. The grading and seeding of land for settlers has a double value; it gives them a crop sooner than could otherwise be obtained, and it shows how land should be prepared for watering. Grading



13861.—I



13861. I

GOULBURN IRRIGATION WORKS.

Scale 1 mile

work has been done on about 600 allotments, the total area graded being over 7,000 acres. Less of this kind of work is now required than at the inception of closer settlement, because private contractors who have gained skill under State direction are doing it for settlers. Through the small cash payment required and the assistance rendered settlers, men of limited means have most of their money available for buying implements and live stock and bringing the land into cultivation. This has enabled many men to obtain homes who could not have done so if left to make a start unaided, and it has greatly accelerated the rate of improvement of farms in all closer settled areas.

In the districts having allotments of water and where lands have been subdivided, progress made in settlement is shown by the following table:-

Progress since the beginning of Closer Settlement, 1909-10.

Settlement.	Lands Purchased and Subdivided by the State.				Subdivided into -				Present Increase in No. of Families.
	Total Area. acres	No. of Properties.	Average Area. acres	No. of Families thereon when purchased.	No. of Closer Settlement Blocks.	Average Area. acres	No. of Closer Settlement Blocks now Occupied.		
Shepparton No. 1	3,200	7	460	6	104	29	102	96	
Shepparton No. 2	6,000	14	429	13	144	38	111	98	
Kyabram	1,000	1	..	3	35	27	16	13	
Tongala	15,200	31	490	30	240	61	182	152	
Bamawm	13,400	28	480	21	178	71	146	125	
Nanneella	8,600	16	535	6	106	78	81	75	
Cornelia Creek (including Koyuga)	6,700	1	..	..	75	86	64	64	
Cohuna	11,500	27	426	8	131	84	101	93	
Swan Hill	5,400	18	300	10	84	63	60	50	
Werribee	6,200	1	..	6	152	40	40	34	
Nyah	..	..	1	..	100	29	71	71	
Merbein..	..	(Crown Lands)	..	..	186	32	182	182	
	..	145	..	103	1,535	..	1,156	1,053	

From the above it will be seen that there are now eleven times as many families in these settlements as there were on the same areas four years ago. The increase in population has not, however, been as significant as the improvements in cultivation. The fact that practically all the land-owners are beginners in irrigation, and are wedded to the crops and methods of cultivation suited to rainfall, has, in the past, been the greatest obstacle to irrigation development. It has taken much effort to bring about the changes needed to secure the largest benefits from irrigation; but it is the testimony of the Commission's officers, and of all other observers, that the progress made this year is so marked, and the results so generally encouraging, that it will not be many years before irrigation and intense culture are synonymous terms in closer settled areas. During the year over 1,000 acres were planted with orchards, and over 2,000 acres seeded to lucerne in the Shepparton District, while at Bamawm there are now 700 acres of orchard and 6,000 acres of lucerne, where three years ago there was not an acre of either.

EXTENSION OF IRRIGATION.

Consideration is being given to the relative merits of a number of important schemes for conserving water and bringing large additional areas of land under irrigation. One of these is the construction of a reservoir on the upper part of the Goulburn River to hold 750,000 acre-feet of water, and provide for irrigating 250,000 acres. The investigations and surveys necessary to the preparation of plans and estimates for this work have been completed.

An important scheme for extending the use of the Murray has been investigated: it involves the construction of a reservoir at Cumberoona by the States of Victoria and New South Wales. This reservoir would impound about 1,000,000 acre-feet of water, and make possible the irrigation of 250,000 acres of land in Victoria between Yarrawonga and Numurkah, which for evenness of surface, fertility of soil, and general suitability for intense culture is unsurpassed in the State.



THE GOULBURN WEIR AT NAGAMBIE.

Plans and estimates were made several years ago for the construction of a reservoir on the upper part of the Campaspe River, which would hold about 100,000 acre-feet of water, and irrigate 40,000 acres of excellent land along the railway line between Rochester and Elmore.

All these projects are in the north-eastern part of the State, but a new and promising field for irrigation development is opening up in Gippsland, in the south-eastern part. This portion of the State has a better rainfall than the north, but not enough to bring into full fruition the great opportunities of 100,000 acres of rich river flats. These, if irrigated, can support many times the present population.

In addition to irrigation under State control, there are 719 permits and licences for private diversions of water. About 20,000 acres are irrigated as a result of such private diversions.

LEGAL AND SOCIAL FEATURES.

A conspicuous social feature of Victorian irrigation is the absence of controversies over water rights, and of the waste and loss which this has imposed on so many irrigated countries. For the last ten years there has not been a single water-right law suit in this State. In many irrigated countries litigation forms a large and continuous part of the operating expenses of irrigation works. Victorian works are also free from the abuses and excessive charges which are frequently manifest where private ownership of water, or rights equivalent to such ownership of water, are recognized; and from the impoverishment of water users which so often occurs where there is separate private ownership of the land to be irrigated and of the water which fertilizes it. In Victoria the price which irrigators pay for water is measured by the cost of supplying it; no charge is made for the water itself, and no profit is derived, or expected to be derived, from irrigation works. The title to water is retained perpetually by the State. Riparian rights, which are so objectionable a feature of the water laws of many English-speaking countries, have been practically eliminated by the State retaining ownership of the beds of streams and a strip of land from 1 to 3 chains wide along each bank. This makes the State the sole riparian proprietor, and those who wish to divert water must obtain State consent. At the outset it was the intention to have irrigation works owned and operated by local authorities, the State furnishing the money, but the irrigation trusts building and operating the works. This, however, did not give satisfactory results, local authorities finding it difficult to impose charges equal to meeting operating expenses and the payment of interest. After the writing-off of considerable sums of arrears of interest, the Government resumed the control of practically all the irrigation works of the State under an Act passed largely through the efforts of the Honorable George Swinburne, who was then Minister of Water Supply. After these works were resumed, the State entered on comprehensive plans for their reconstruction, and for the extension of irrigation, in order to reach the best land and utilize the available water supply in the most economical and effective manner.

While as a whole the water laws of Victoria and the social conditions of irrigation districts will compare favorably with those of other countries, and are worthy of study by all developing countries, they possess one significant omission which sooner or later will have to be supplied. This is the absence of any distinction between older and later rights. Nearly all irrigation codes outside those of Australia provide that the earlier users of water shall have preference over later users, and that, when there is a scarcity of water which prevents all being supplied, those who have last made use of the water shall be the first to be cut off. The reason for this law is that some principle of this kind is needed to maintain the conditions which existed at the time each irrigator incurred the expenditure necessary to the cultivation of his land and the use of water. Without the protection of this principle every increase in the use of streams beyond a certain limit threatens the safety of existing rights, and becomes a source of anxiety to the occupiers of all older irrigated areas. If it were possible to say with certainty that any given stream would irrigate a certain number of acres of land, and that this acreage would be

uniform from year to year, then the acreage could be mathematically determined, boundaries established, and all further extensions prohibited; nothing resembling this occurs in nature. Streams vary greatly in flow from year to year, and in the different months of different years. The most uniform river in Victoria, the Goulburn, has in some seasons carried five times as much water as it has in other seasons, and on some streams the flow of good years is ten times that of poor ones.

In time it will be necessary to do one of two things, either to restrict irrigation to the area that can be supplied in years of minimum flow, without the aid of regulation by storage, which would result in a great waste of water, or establish a system of priorities of right by which all earlier users would be protected in all seasons, and those who came later informed at the time of settlement exactly the hazard they ran in utilizing the



MAIN CHANNEL, GOULBURN TO WARANGA RESERVOIR.

available water under inferior rights. With this principle in operation, it is possible to utilize the full water resources of a country without injustice to any one: holders of the later priorities, knowing exactly the uncertainty of their supply, do not plant orchards or gardens, but grow crops on which an occasional shortage of water will not have any disastrous effect.

The State works for irrigation and water supply are under the control of a Commission of three members, called the State Rivers and Water Supply Commission. This body also exercises authority over all streams and issues the licences and permits for private diversions of water.

There are 18 Irrigation and Water Supply Districts and 26 Waterworks Districts under the control of, and 32 towns supplied with water from works managed by, the Commission.

AGRICULTURE IN VICTORIA.

By Dr. S. S. Cameron, Director of Agriculture, Victoria.

The history of the evolution of agriculture in Victoria is much the same as in older countries as regards the stages by which the present position has been reached, but these stages have transpired more quickly. Prior to the gold-mining era, which commenced in the early fifties, there was practically no agriculture carried on; that was the purely "pastoral age." With the increase of population incident on gold finding the cultivation of the land to supply the needs of the people in other than flesh foods became necessary, and for a time very profitable. Extraordinary tales are told by still living pioneers of the exorbitant prices that were paid on the "diggings" for potatoes, cabbages, peas, &c. It was perhaps on account of the large quantities of such vegetables that were produced and exported to the neighbouring States that Victoria came to be known at a later date as "The Garden State."

When the gold fever somewhat abated, attention was turned to the land, and during the sixties and seventies legislation in the direction of "unlocking the lands" from the tenure of the "squatters," to whom it had been conditionally granted, was the staple political activity. So it came about that in the best rainfall parts of the State the pastoral became gradually transformed into agricultural properties. A broad system of agriculture certainly it was, very different from the closer "farming" of land as practised in the old country, but nevertheless serving for the development of agricultural pursuits and the preparation of the land for the system of intensive farming of small areas which is the inevitable destiny of Victorian agriculture in the near future.

Wheat-growing became the main agricultural industry in the seventies and eighties, continuous cropping of the same land year after year being the practice. No manure or fertilizer was used, and the payable crops that were harvested for many years were a full testimony to the natural fertility of much of the virgin land of the State. The growing of other cereals was extensively practised, and oaten hay early became, and still remains, the principal fodder for all classes of farm stock. The meadow hay of the old country is practically unknown in Australia. Seeded grasses do not grow into a heavy body of feed on account of the early onset and greater intensity of summer weather, and in the early days the standing or fallen timber on areas left for natural grass prevented it being mown for hay. So that a substitute had to be found, and it became the custom to cut unripened cereal crops and conserve them as hay.

The next stage in the development of the agriculture of the State was the establishment of the dairying industry. Prior to the early nineties only such dairy produce as could be consumed within the State was produced, and the prices obtained for it were very low. It was only the cheapness of land which made it possible for butter to be sold at sixpence, and occasionally as low as threepence, per pound. In the later eighties attention was given to the possibility of exporting butter and other dairy produce to England, and

from 1890 onwards the industry has developed to an enormous extent, the value of the exports having risen to upwards of $2\frac{1}{2}$ millions sterling annually.

Following closely on the establishment of the dairying industry came fruit-growing, including viticulture. The soils and climate are admirably adapted for fruit, and it is possible that it is in this direction the greatest future development in the agricultural output of the State will occur. Victorian wines have for some time had an established place on the home market, and during the last few years it has become somewhat difficult to supply the quantities required, so keen has the competition of other forms of agriculture with viticulture become. With the aid of cool storage at country depôts and on board ship during transit, already the exports of hard fruits to Europe have reached 300,000 cases annually, and increased areas planted to fruit during the last five years indicate so rapid an expansion of production that the exports of fruit may shortly rival those from the dairy. Both these last referred-to industries have received a fillip during the second half of the last decade as a result of the vigorous policy that has been adopted by the Government towards the development of irrigation agriculture; and they also constitute the means whereby the thousands of settlers from overseas who have arrived in Victoria during the last few years may best attain success as landed proprietors under the Government system of Closer Settlement.

During the period sketched, great changes of agricultural methods and practices have followed quickly on one another. The exhaustion of the fertility of virgin land through continuous cropping has rendered necessary the use of artificial fertilizers, and upwards of 80,000 tons of superphosphate are now utilized annually. Fallowing land for wheat has also become universal, and suitable crop rotations are being steadily introduced. Perhaps the most remarkable aid to advancement in agriculture has been the development of agricultural implements and machinery, designed to lessen the amount of manual labour, for Victoria has always been a land of high wages, and the problem that has had to be faced throughout, and still has to be faced, is the reduction of the ratio borne by human to mechanical labour or to horse-power on the farm.

The inventive capacity of Australians has been forced into the production of labour-saving appliances for all agricultural operations. Thus has come to hand the multi-furrow plough with teams of eight, ten, and twelve horses, or mechanical tractors turning from 5 to 20 acres per day; and the broad twenty-one hoed seed drill has come into regular use. The complete harvester, which in one operation strips, thrashes, winnows and bags the crop of wheat, is perhaps the greatest triumph in this direction so far, though never a year passes which does not witness the adoption of some improvement to help the farmer to produce at lessened cost. Perhaps the feature on an Australian farm which strikes an oversea visitor most is the quantity and diversity of the discarded implements which have been quickly superseded by others more effective.

Synchronous with improvements in methods has been the increase in production, and consequential rapid increase in land values. In certain of the richer dairying districts of the State, land which could be bought

twenty years ago for from £10 to £15 per acre, and on which but a bare living could then be made, has, by the adoption of improved methods and the establishment of better and steadier markets, risen in value to £40 and £50 per acre. In similar proportion, though, of course, at much lower levels, wheat and hay growing lands have appreciated, and along with this appreciation in land values has come the necessity for more careful, more economical, and more scientific treatment of the land. Thus is being brought about the destiny of agriculture in Victoria, viz., a system of "farming" land, in the sense in which the term is known to the best agriculturists in the more closely settled countries of the old world. Such improved farming is inevitable, since the agricultural output must increase, and that increase must in the future depend more largely on increased acreage yields, than on increase of area cultivated, even though the possibilities of the latter are still very great.

Rainfall.

The rainfall of a country is of the greatest importance to its welfare, and upon the distribution and amount of such depends, to a great extent, the prosperity or otherwise of a community. The rainfall of Victoria varies in different districts from over 60 to under 15 inches. The distribution of the rainfall is shown in a map which appears in another part of this handbook. (See map in article on "The Problems in the State of Victoria which await Scientific Solution," page 47.)

It is equally important to know the areas in the State subject to the various amounts of rainfall from over 60 to under 15 inches. Knowing this and the soil characteristics, the regions suited to any one agricultural product and the possible quantity that can be produced are readily determined. The areas of varying rainfall are approximately as follows:—

Rainfall.			Area in Sq. Miles.
Over 60 inches	..	..	1,597
,, 50–60 „	..	..	3,348
,, 40–50 „	..	..	7,055
,, 30–40 „	..	..	14,029
,, 25–30 „	..	..	15,247
,, 20–25 „	..	..	14,070
,, 15–20 „	..	..	12,626
Under 15 „	..	..	19,912

District Agriculture.

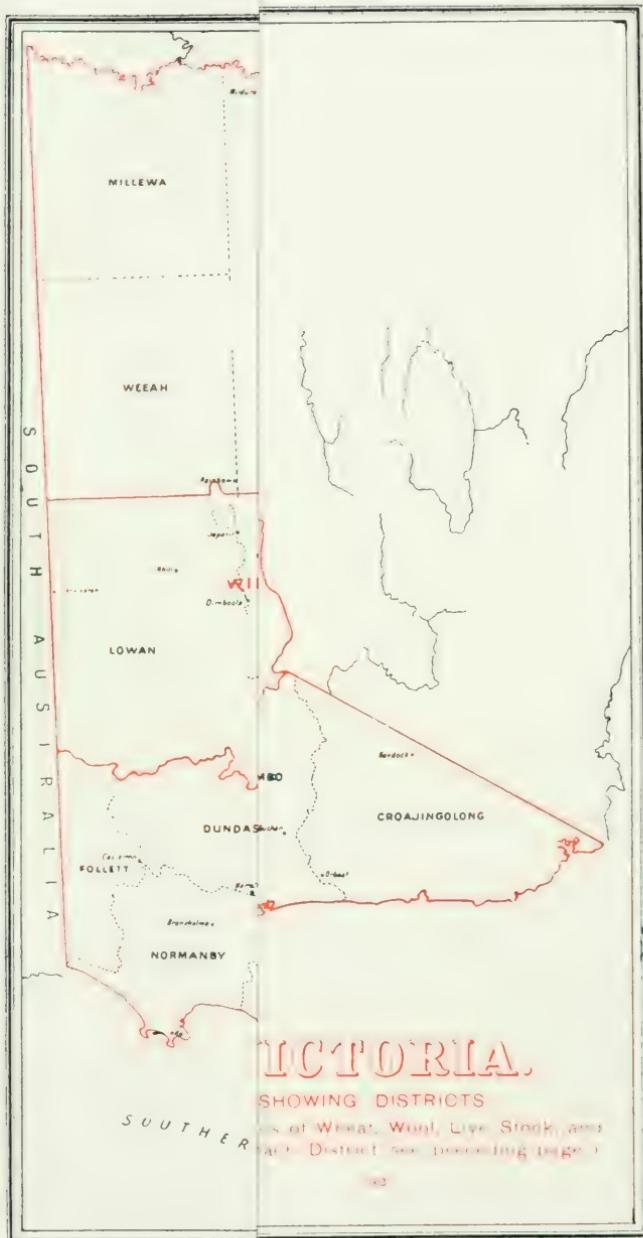
The State of Victoria may be divided up for description of its agricultural purposes into eight districts, as follows:—

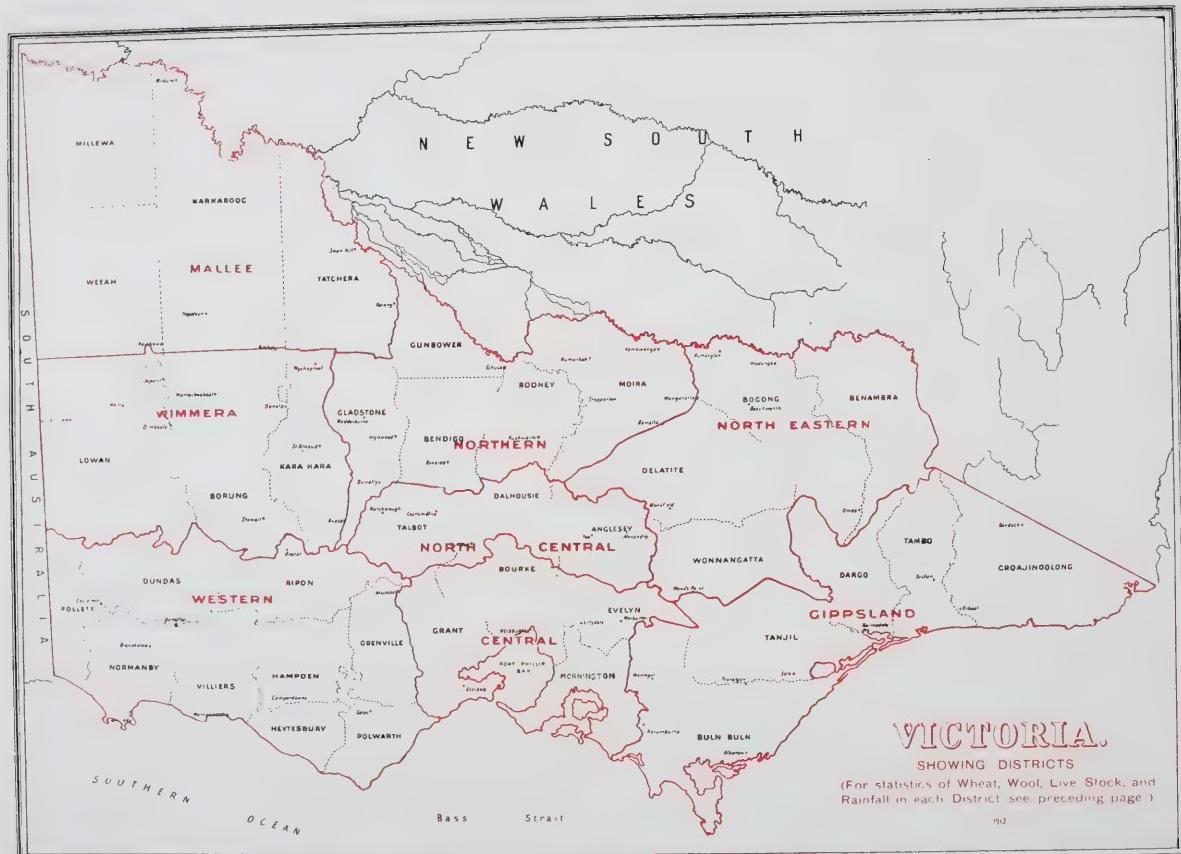
- Central District,
- North Central,
- Western,
- Wimmera,
- Mallee,
- Northern,
- North-East,
- Gippsland.

STATISTICS OF WHEAT, WOOL, LIVE STOCK, AND RAINFALL IN EACH DISTRICT OF VICTORIA.

(For Location of Districts see accompanying Map.)

Year.	Wheat.			Live Stock.					
	Average Rain-fall.	Area.	Total Production.	Average per Acre.	Wool Produced.	Horses.	Cattle.	Sheep.	Pigs.
	inches.	acres.	bushels.	bushels.	lbs.	No.	No.	No.	No.
<i>Central District.</i>									
1908-9	18.78	9,236	163,301	17.68	6,395,534	83,430	249,754	988,609	30,624
1909-10	29.43	25,958	353,277	13.61	6,794,222	87,545	246,096	993,509	37,241
1910-11	28.71	54,684	990,024	18.10	7,009,806	93,962	247,740	1,052,694	56,795
1911-12	36.88	21,831	227,223	10.41	8,073,234	100,156	262,895	1,191,787	60,881
1912-13	24.92	16,629	278,751	16.76	6,825,724	104,852	245,792	1,042,088	43,782
<i>North-Central District.</i>									
1908-9	18.82	14,564	276,847	19.01	5,981,221	29,647	102,920	899,844	10,785
1909-10	26.47	33,947	478,866	14.11	7,619,723	29,830	100,446	978,010	12,946
1910-11	28.01	42,917	683,831	15.93	8,174,984	30,317	99,923	1,044,713	20,265
1911-12	29.79	19,256	207,048	10.75	8,846,693	30,848	102,817	1,109,763	19,809
1912-13	23.00	16,356	280,259	17.14	6,309,957	31,138	94,417	926,835	13,322
<i>Western District.</i>									
1908-9	27.91	72,860	1,568,587	21.53	35,185,426	64,528	340,229	4,630,865	47,240
1909-10	32.40	106,513	1,543,103	14.49	33,420,517	66,431	317,806	4,335,579	53,978
1910-11	33.61	173,332	2,874,349	16.58	36,298,354	72,903	316,772	4,100,068	75,688
1911-12	31.13	143,003	1,376,157	9.62	36,755,561	75,057	351,424	4,399,158	75,044
1912-13	26.94	159,480	3,123,685	19.59	34,474,455	79,360	346,586	4,205,332	54,716
<i>Wimmera District.</i>									
1908-9	16.79	562,318	9,054,467	16.10	16,225,239	58,818	57,349	2,234,415	7,251
1909-10	20.47	620,183	9,551,916	15.40	17,269,427	62,189	57,163	2,266,134	8,628
1910-11	21.90	644,012	8,961,701	13.92	18,141,949	67,328	56,196	2,205,610	13,243
1911-12	19.89	603,141	6,894,314	11.43	19,389,424	70,050	56,490	2,264,108	11,962
1912-13	17.52	532,530	7,714,587	14.49	15,366,581	72,352	51,721	1,930,184	7,859
<i>Mallee District.</i>									
1908-9	12.99	558,837	4,567,184	8.17	3,374,055	26,586	41,321	507,323	4,118
1909-10	15.53	558,659	5,773,743	10.33	4,768,445	29,082	41,025	632,987	5,600
1910-11	16.98	659,996	7,854,074	11.90	5,406,939	34,800	49,343	679,432	11,257
1911-12	17.84	617,445	3,684,315	5.97	6,694,486	41,305	49,639	809,654	12,063
1912-13	12.50	705,134	5,436,937	7.71	4,401,530	43,996	38,118	565,882	6,784
<i>Northern District.</i>									
1908-9	14.70	525,712	7,098,600	13.50	11,031,344	82,058	192,624	1,733,515	18,926
1909-10	20.38	685,782	10,233,144	14.92	14,415,259	85,588	211,368	2,024,684	27,358
1910-11	19.98	744,311	12,033,881	16.17	15,757,221	89,327	213,668	2,048,886	44,857
1911-12	19.87	694,448	7,844,992	11.30	17,220,967	100,005	210,993	2,027,841	44,832
1912-13	18.12	599,287	8,398,971	14.01	10,641,390	105,374	179,128	1,516,653	24,936
<i>North-Eastern District.</i>									
1908-9	24.65	34,478	592,587	17.19	4,604,137	35,860	218,368	757,324	12,796
1909-10	35.70	58,454	681,297	11.66	5,589,948	36,924	213,366	799,997	17,307
1910-11	31.36	66,203	1,160,357	17.53	5,166,612	37,297	207,004	783,052	26,581
1911-12	33.24	55,506	538,246	9.70	6,461,106	40,138	222,983	880,024	27,624
1912-13	30.93	48,479	821,788	16.95	4,528,558	41,285	190,589	696,116	17,938
<i>Gippsland District.</i>									
1908-9	23.24	1,900	24,076	12.67	4,739,495	43,976	371,597	793,847	47,618
1909-10	33.19	7,666	164,754	21.49	5,455,288	45,240	362,370	907,083	54,863
1910-11	29.02	12,634	254,802	20.17	5,847,779	46,146	356,923	968,210	84,595
1911-12	39.71	9,404	119,582	12.72	7,021,570	50,254	389,886	1,175,469	95,854
1912-13	26.60	7,321	168,126	22.96	6,214,417	52,137	361,738	1,009,134	70,735
<i>State of Victoria.</i>									
1908-9	19.87	1,779,905	23,345,649	13.12	87,536,451	424,903	1,574,162	12,545,742	179,358
1909-10	26.86	2,097,162	28,780,100	13.72	95,332,829	442,829	1,549,640	12,937,983	217,921
1910-11	26.42	2,398,089	34,813,019	14.52	101,803,644	472,080	1,547,569	12,882,665	333,281
1911-12	28.54	2,164,066	20,891,877	9.65	110,463,041	507,813	1,647,127	13,857,804	348,069
1912-13	22.44	2,085,216	26,223,104	12.58	88,762,612	530,494	1,508,089	11,892,224	240,072





The accompanying map shows these districts; and in a statement which precedes it are given particulars of the rainfall, wheat, wool, and live stock for the latest quinquennial period available. A short description will possibly be instructive.

(1) *Central District*.—The soils of this district are varied in character, but are suited to a large range of products. Included in the district are three distinct types of soil, namely:—

(a) Hill country, containing Devonian, metamorphic, granitic, and Ordovician rocks and soils derived from them. These soils are rich in potash, but poor in nitrogen and phosphoric acid. Oats will grow well on them, as also green fodder for dairying. The land is peculiarly suited to fruit-growing. Owing to the clay subsoil, the effect of droughts is not so much felt, and improvement through cultivation is easily effected.

(b) Coastal plain country, between Melbourne and Westernport. This is all tertiary, and broken into undulating hills and valleys. The amount of nitrogen present in the soil is fairly high, and the vegetation profuse. Many parts require draining and fallowing. For the most part it is light loamy sandy land, and sometimes black in colour.

(c) Volcanic land, of which there are two kinds—

(a) Friable loam, produced by lighter materials projected from volcanoes, and which is similar to some of the richest land in the Western District.

(b) Heavy clay loams intersected by reefs of basalt and covered with "floaters" and containing "buckshot." When phosphoric acid is added, good wheat crops are obtained.

The rainfall ranges from 20 to 60 inches per annum. This district grows 49 per cent. of the barley produced in the State; also a large proportion—41·75 per cent.—of the potatoes, 22·42 per cent. of the hay, and 34·82 per cent. of crops such as flax, peas, beans, &c. Owing to its proximity to Melbourne, fruit-growing and market gardening pay very well in suitable locations. Dairying is also carried on extensively, and sheep do well in many parts.

(2) *North-Central District*.—This district is similar to the Central District, and contains hill soils; also a little of the tertiaries of the northern areas. In places volcanic soil is present. This district grows 20·92 per cent. of the potatoes produced in the State and 9·63 per cent. of the barley. The area embraces some very rough and inaccessible country. The grazing of sheep is one of the chief pursuits. Dairying and pig raising are also carried on extensively.

(3) *Western District*.—This district comprises, for the most part, rich volcanic undulating plains, often stretching for miles without any break. The pastoral industry is the most important, and the best wool in the State is produced here. This is the premier dairying district; 20·70 per cent. of the potato crop and 13·73 per cent. of the hay are grown in this part of the State, and on the best land onions are largely produced. Recently, wheat-growing has been developing steadily in some parts, a system of share farming being much in vogue.

(4) *Wimmera District*.—This district is characterized by a splendid red, chocolate or grey loam, and is eminently suited for wheat-growing, having an average rainfall of from 15 to 18 inches. Of the total wheat crop 27·87 per cent. is produced here. The rainfall diminishes from east to west, but the lime in the soil increases towards the west.

The lighter loams of the Wimmera and Mallee have a greater percentage of available plant food than the stiffer soils of the Goulburn Valley. The addition of phosphates makes a large difference in the yield obtained. This district grows 28·14 per cent. of the total oats and 17·96 per cent. of the hay of the State. Sheep are also extensively grazed, and lamb raising for export, combined with wheat-growing, is producing the very satisfactory results which farmers in this part of the State achieve.

(5) *Mallee District*.—The soil of this district is a light sandy loam, which in the poorest spots becomes nearly pure sand. The undulating character of the surface of the country has been brought about by the shifting of the sandy surface soils through wind action. The rainfall varies from 15 inches as a maximum, and excellent wheat crops are obtained. The soil is very easy to cultivate, thus cheapening the cost of production of the crops grown on it.

The district grows 28·53 per cent. of the wheat, and 11·82 per cent. of the oats of the State. Sheep-breeding is carried on in conjunction with the wheat farming.

(6) *Northern District*.—This district has the same Tertiary and alluvial soil. It is characterized by alternate belts of timber and plain land, and is the premier wheat-producing district. The rainfall varies from 20 to 25 inches, and a variety of products is grown, including 32·09 per cent. of the wheat in the State, 26·45 per cent. of the oats, 19·89 per cent. of the hay, and 13·83 per cent. of the various other crops. In addition, orcharding is extensively carried out, and irrigation farming is developing rapidly.

(7) *North-Eastern District*.—This district contains the same Tertiary soil as the Northern District, but it also has a large mountainous area with high rainfall. The valleys are very fertile, and are highly adapted for intense culture. Wheat is grown to a slight extent, also oats and hay. Vineyards and orchards are doing well in the district. Sheep and cattle are also extensively bred.

The river valley has proven most suitable for the cultivation of tobacco, and the bulk of the tobacco produced in the State is grown in this district.

(8) *Gippsland District*.—This area has a variety of soils ranging through coastal plain land, volcanic hill country, and, in places, rich alluvial valleys and flats. The rainfall is high—from 25 to 60 inches—and many parts are very mountainous. The district is not subject to drought, and is adapted for the growth of barley, potatoes, maize, and tobacco. Dairying is also carried on extensively and profitably, and cattle breeding and fattening is largely undertaken. The district is not at present developed to the extent that the other districts are; but attention has lately been largely directed to its possibilities, and development—aided by railway and road construction—is proceeding rapidly.

Crops Produced.

From the foregoing it will be seen that the State of Victoria is capable of producing within its boundaries almost any variety of agricultural produce grown in temperate zones. It has an area of 56 million acres, and in 1912 only 9·08 per cent of this area was under cultivation, so that there is enormous scope for development.

The cultivation of the principal crops in Victoria at present is set out in the following table in acres:—

Crop.	1909.	1910.	1911.	1912.	1913.
Wheat	1,779,905	2,097,162	2,398,089	2,164,066	2,085,216
Oats	419,869	384,226	392,681	302,238	439,242
Barley	64,648	58,603	52,687	53,541	71,631
Hay	956,671	864,359	832,669	860,205	1,203,728
Potatoes	47,903	62,390	62,904	47,692	47,575
Orchards	54,946	56,108	57,375	59,985	63,209
Vines	24,430	22,768	23,412	24,193	24,579
Market Gardens	9,279	10,214	10,778	10,331	10,414
Land in Fallow	1,034,422	1,175,750	1,434,177	1,469,608	1,627,223
Sown Grasses	1,029,711	988,671	991,195	1,041,772	1,085,346

The total yields of these crops and the average per acre for the whole State are shown in the attached Table A:—

TABLE A.—TOTAL YIELDS AND AVERAGE YIELDS PER ACRE OF VARIOUS CROPS GROWN IN VICTORIA.

Crops.	1908-9.		1909-10.		1910-11.	
	Total Production.	Average per acre.	Total Production.	Average per acre.	Total Production.	Average per acre.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat ..	23,345,649	13.12	28,780,100	13.72	34,813,019	14.52
Oats ..	11,124,940	26.50	7,913,423	20.60	9,699,127	24.70
Barley ..	1,511,181	23.38	1,023,384	17.46	1,340,387	25.44
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Hay ..	1,415,746	1.48	1,186,738	1.37	1,292,410	1.55
Potatoes ..	152,840	3.19	174,970	2.80	163,312	2.60

Crops.	1911-12.		1912-13.	
	Total Production.	Average per acre.	Total Production.	Average per acre.
	Bushels.	Bushels.	Bushels.	Bushels.
Wheat ..	20,891,877	9.65	26,223,104	12.58
Oats ..	4,585,326	15.17	8,323,639	18.95
Barley ..	1,024,584	19.14	1,744,527	24.42
	Tons.	Tons.	Tons.	Tons.
Hay ..	1,032,288	1.20	1,572,933	1.27
Potatoes ..	119,092	2.50	191,112	4.02

Taking the various crops separately—

(1) *Wheat*.—Victoria is *the* wheat-producing State of the Commonwealth, and has produced more wheat during the last decade than any other State. The value of the output of this cereal during that period reached approximately 35 millions sterling.

The wheat industry in Victoria may be said to be still in its infancy. Some idea of the development possible may be gained from the fact that, of the total area of Victoria (56,245,740 acres), less than 10 per cent. is at present under cultivation, and less than 5 per cent. under wheat. Vast areas of country eminently suited for cereal culture and lamb raising are at present utilized under purely pastoral conditions. The area under cultivation is steadily increasing. This year (1913) constitutes a record—2,581,000 acres.



“BROAD AGRICULTURE.”

One reason for the popularity of wheat-growing is that the grain always commands a ready sale, and a large amount is annually exported to other countries, where it is in demand on account of the excellent colour of the flour produced from it.

The special methods of cultivation are principally—(1) seeding on well prepared fallows, (2) use of artificial manures, and (3) the adoption of suitable rotations.

(2) *Oats*.—The crop of oats in Victoria is used for two purposes—(a) milling and production of oatmeal, &c.; (b) for feeding horses and other stock. In addition to these uses, a large quantity of oats, particularly of the Algerian variety, is annually cut for hay. The crop grows rapidly and profusely, and very payable yields are obtained in the areas suitable for their production. The area under crop has been maintained with little variation during recent years.

(3) *Barley*.—This crop is grown largely in certain districts, but has not occupied a very important position among the cereals in Victoria. The grain is used for malting purposes, whilst a considerable area is sown for producing green feed during the winter and early spring for dairy cattle, sheep, &c.

Good average yields are obtained, and the area under cultivation is increasing. In some districts uneven ripening has caused a falling off in barley cultivation.

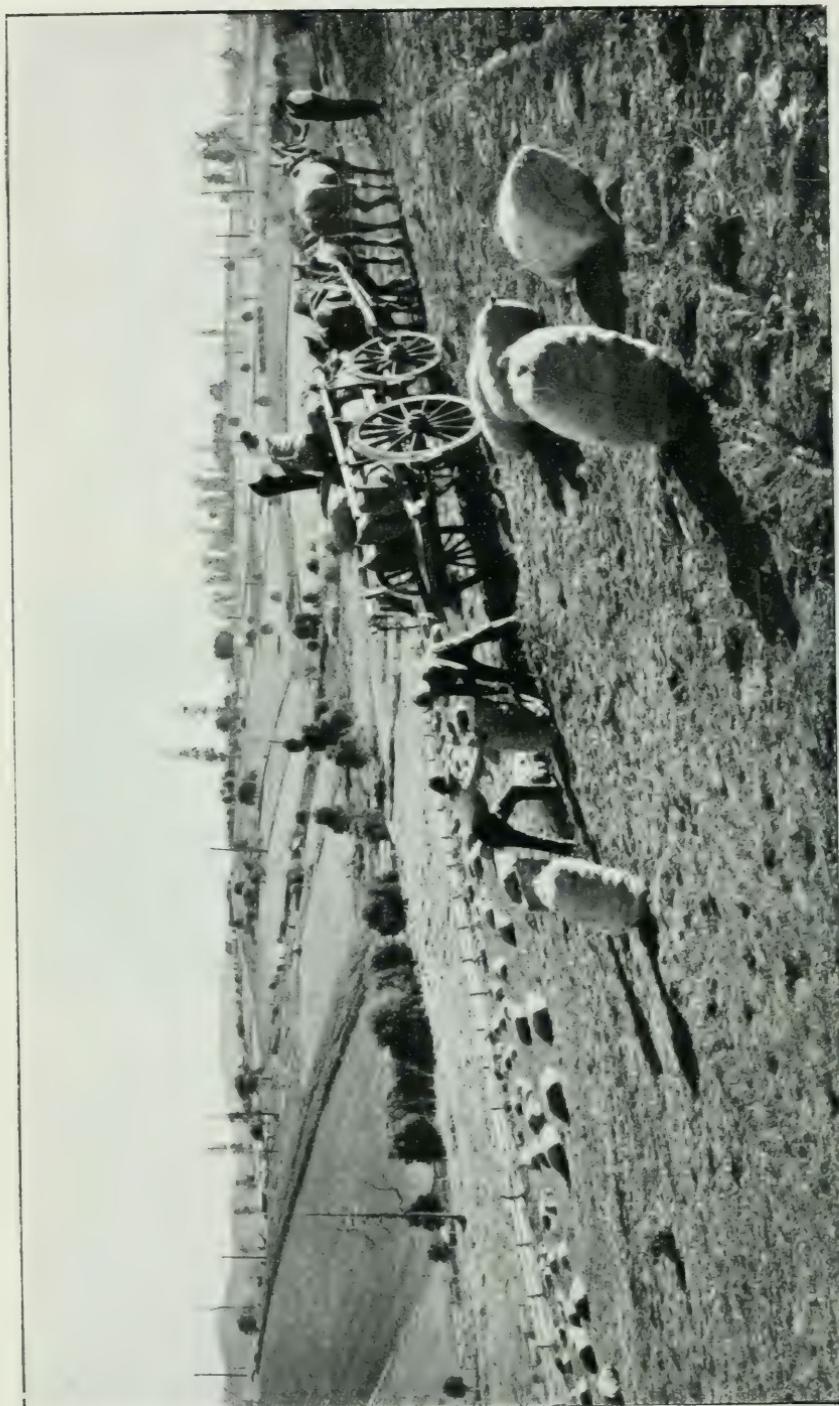
(4) *Hay*.—The production of hay is limited and depends on the number of stock in the country. It is used for working horses and fed to dairy cows. In some areas it pays the farmer better to cut his crop for hay than to harvest as grain. This is especially so in areas near the large centres of population. It is a great standby in case of drought, and on all well managed farms reserves of hay, straw, and silage are kept. The area has increased satisfactorily during recent years.

(5) *Potatoes*.—The production of potatoes has declined latterly owing to the spread of Irish Blight. A peculiar circumstance is the alternation of prices obtained each year. This is owing to insufficient market facilities. A large Inter-State trade is done in this product.

The Live Stock Industry.

Ever since the arrival of the Hentys in 1835, with their small nucleus of live stock, the suitability of Victoria for the breeding and rearing of farm animals has year by year been accentuated. The stock brought from Tasmania and New South Wales by these early pioneers formed the foundation of the flocks and herds which established pastoral and live-stock husbandry as the greatest wealth-producing asset of the State.

Since the early years of settlement, few drawbacks to the rapid increase in numbers of live stock have been experienced; for, with the exception of the dingo—a species of wild dog now practically exterminated—the continent of Australia contains no wild animals destructive to domestic stock. The depredations of hostile tribes of aborigines were felt for a time by the first settlers, who were also under the discouraging influence of the low prices which prevailed through the paucity of population, and the distance from, and difficulty of communicating with, the home markets. But, despite these adverse influences—which quickly passed away—the natural suitability of the country for breeding live stock was quickly demonstrated, and, in 1850, about fifteen years after the first driblets of the various kinds of domestic stock were introduced, the stock census then taken showed the colony to be possessed of 21,219 horses, 378,806 cattle, 6,032,783 sheep, and 9,260 pigs. A year later gold was discovered, and the population during the next decade increased from 76,162 persons to 541,800. Large quantities of live stock were slaughtered for the food supply of this exceptional influx of people. Notwithstanding this heavy drain, during the period 1851–1861 cattle were almost doubled in numbers, being increased to 628,092. Sheep a little more than held their own, the total being 6,239,258. Pigs showed an almost five-fold increase—to 43,480—and the number of horses also increased to 84,057. In the year last mentioned (1861) wool to an amount of upwards of 22,500,000 pounds was exported.



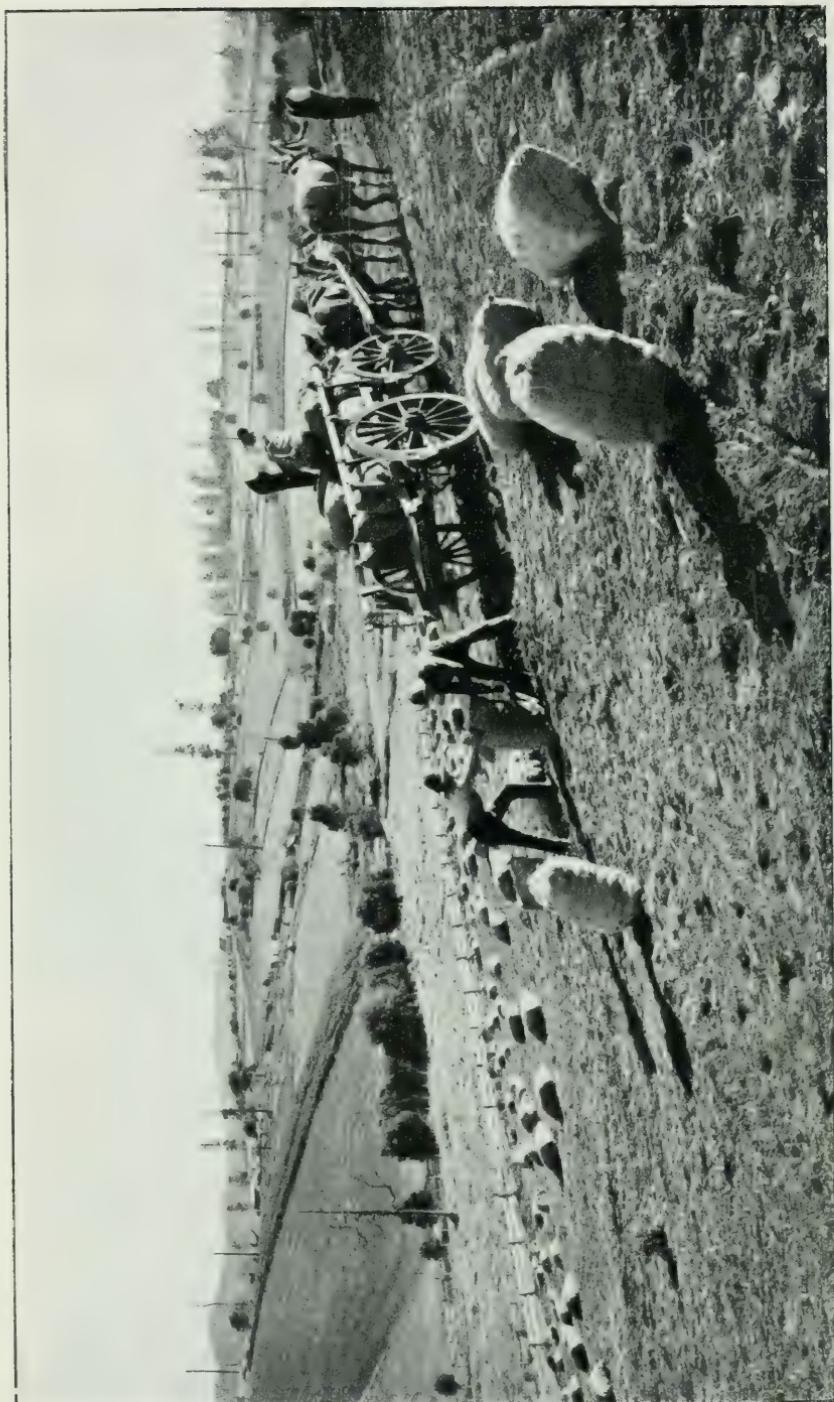
HARVESTING ONIONS.

Passing over the next 30 years, during which period wool production, and the rearing of live stock generally, became one of the bulwarks of the national wealth, the year 1891 saw the commencement, on a commercial scale, of the dairying industry, and a consequential rapid increase in dairy cows particularly. In that year the numbers of cattle stock had grown to 1,782,881, of which 395,192 were dairy cows. Horses had increased to 436,469, sheep to 12,692,843, and pigs to 282,157. With the establishment and yearly progress of the dairying industry, both the milch cows and pigs rapidly increased; and in 1912 the former numbered approximately 700,000 and the latter 350,000.

The sheep industry, by means of wool production throughout, and during recent years by means also of mutton export, has been the greatest source of revenue from live stock. For the year 1911, the total wool production of the State, nearly the whole of which was exported, reached over 110,000,000 lbs., having a value of £4,142,747 sterling. In the same year,

Sheep. 1,578,132 carcases of mutton and lamb were exported, the value of which was £798,508; so that the sheep industry, apart from what it supplies to the people of the State in the way of food and clothing, causes an inflow to the State of approximately £1,900,000 annually, that sum being the value on the world's markets of the sheep products exported. The extent of the local consumption of wool may be gauged from the fact that there are nine large woollen mills in Victoria, turning out blankets, tweeds, and other fabrics, and working practically day and night to keep pace with the demand.

The variety of sheep which predominates is the Merino. As is well known, this breed yields the finest and most valuable wool that can be produced, and on it Australia has built up its reputation as the first wool-producing country in the world. The Victorian climate appears to be particularly suitable for this breed, and it has attained a robustness of constitution, an increase of body weight, and a prolificacy in growth of wool far surpassing its progenitors in Spain or the same breed in any other country to which it has been introduced. Indeed, Merino breeders the world over depend on Australia for stud animals to improve their Merino flocks, and large numbers of stud rams and ewes are exported every year. The export trade in stud Merinos to South Africa is at present particularly brisk. These sheep are bred most extensively on large "stations," flocks numbering 10,000, 20,000, and even 50,000 being not at all rare. The breed is also kept by farmers. During recent years, sheep husbandry has become a regular feature of general farming throughout Victoria, but particularly in the wheat-growing areas. It is found to be a most profitable practice to combine sheep-growing with wheat farming, so that the stubble may be profitably utilized, and also that the land, while undergoing fallow, may not be altogether out of use. The practice of sowing rape, legumes, or other fodder crops on fallow ground for the purpose of fattening the season's drop of lambs is quickly extending. Whereas on sheep stations, where excellence as regards wool clip is the desideratum, the Merino is almost solely bred, on farms it is found more profitable to combine wool production with raising lambs for export; and consequently, crossing the Merino with the Lincoln or Leicester breeds is largely practised. A favorite class of sheep is the "Comeback." This is



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really a three-quarter bred Merino, obtained by first crossing Lincoln rams on Merino ewes, and following with a Merino ram on the progeny. "Comebacks" give a good clip of excellent and very saleable variety of wool, and their frame and flesh are much in advance of the pure Merino for mutton. A farmer's flock of 100 "Comeback" ewes will clip, on the average, 7 lbs. per head of wool, selling at 9d. per lb.: and in addition, will lamb between 80 and 90 per cent. The lambs at four months old are saleable for export at from 10s. to 14s. per head; so that a revenue of from £70 to £80 per 100 ewes kept can always be depended on.

The British breeds of sheep are also largely kept, and many of the varieties do exceedingly well. The Lincoln is, perhaps, the most popular of the British breeds, because of the excellence of the cross it makes with the Merino; but the Leicesters—both English and Border—are also very much used for crossing purposes. With the advance of the lamb export trade, the quick-maturing quality of the Shropshire sheep has brought this breed into prominence for crossing purposes. The Southdown, Dorset Horn, and Romney Marsh breeds are also used to a considerable extent. Many farmers keep pure studs of one or other of the British breeds of sheep, both for their own use and also to supply the requirements of others for crossing purposes.

Referring to farmers in the proper sense, as distinguished from sheep farmers or "squatters," it may be said that their cattle represent a much greater actual value than their other live stock. More especially is this so of late years since the dairying industry has assumed such large proportions. Large stations where cattle raising for beef is carried on are now few and far between in Victoria. The occupation of the land for **Cattle.** more profitable purposes and to furnish quicker returns has followed on the netting of the State with railways: and, as closer settlement of the land proceeds, it becomes too valuable for grazing purposes solely. A bullock is not at its prime till four years old: and at that age a good cow will have produced milk to the value of the bullock at least, and still not be at her prime.

Nevertheless, there are many pure studs of the exclusively beef breeds of cattle in Victoria: and the large cattle stations of Queensland and the other States have their blood replenished from time to time from the many famous Shorthorn, Hereford, and Polled Angus studs, which were founded in pre-dairying days, and which are still kept intact and at such a high standard of excellence as to command the confidence and patronage of breeders throughout the Commonwealth.

Although the number of cattle bred in Victoria solely for beef production is not great, a considerable amount of fattening of stores received from Queensland and other States goes on to meet the weekly public consumption of beef. Such fattening is not assisted in any way by artificial or hand feeding or housing. It takes place by natural grazing in the paddocks exclusively. The climate is so mild and grass so continuously available that even throughout the winter months fat cattle are brought to the sale yards direct from the pasture. The cattle census of Victoria in 1912 showed 1,647,127 head.

Dairying is very popular, and one of the most profitable rural industries in Victoria. It is the means whereby extensive districts—notably

Gippsland have been opened up for farming. Many large properties in other parts of the State, that a few years ago were devoted exclusively to sheep, have been subdivided, and let or sold to dairy farmers. In 1912

Dairy Cows. there were 699,555 head of dairy cows in Victoria, distributed amongst 49,158 dairy farmers—a little over thirteen cows per farm; so that it will be seen that in dairying the small farmer preponderates, although there are many herds running to 50, 100, and even 400 cows. It is on these large farms that most difficulty is experienced in getting satisfactory labour; and, in consequence, the milking machine is used on many of them.

Many subdivided estates are let on what is known as the "share" system. In such cases the land and capital for stock and implements are supplied by the owner, and the share partner supplies the labour. In the case of large families working well together on such a share system, very satisfactory profits can be made; and it is not long before a man can in this way secure a farm of his own. Indeed, there are many instances in which the share partner has ultimately purchased the farm he has been working in conjunction with the owner.

As with beef cattle, so with dairy cows, the practice is to depend largely on the pasture, although increased profits are earned when hand-feeding is adopted, and where housing or suitable winter shelter is provided. The growing of maize and sorghum to make into silage for winter feeding is becoming fairly general among the more progressive farmers. Many farmers have followed the practice in years past of drying off their cows in the autumn and letting them remain out of profit until the spring, rather than make provision for giving them a little extra fodder during the colder months. It speaks well for the natural advantages of the country that, with such improvident practices ruling, the dairying industry has developed so rapidly. This system is, however, fast going out of use, and continuity of production the year round is now being aimed at in the best herds.

As yet, the class of dairy cows generally met with in the State is rather mediocre, and there is an increased profit awaiting those who, in the future, may specialize in the direction of heavier-yielding cows. In the early days of settlement, the cattle of the State were mainly Shorthorn and Hereford, and the dairy stock still show evidence of descent from these breeds, particularly the former. Indeed, a strain of Shorthorn, in which milk production has been well developed, is very popular on large dairy farms where the land is rich. On lighter land and on smaller farms, the milking breeds—Ayrshires and Jerseys—and light-weight cross-bred stock are in more general use. The Ayrshire has become very popular during recent years, and the breeding of pure stock has become so general that pedigree bulls for herd use can now be purchased at a price within the reach of all. The combination of pedigree breeding of Ayrshires and Jerseys with milk production has been followed by many dairy farmers with most profitable results. Pedigree cows of either breed, with youth on their side and in full milk, can be purchased at from £10 to £20, and grade cows or cross-breds realize from £6 to £12 at calving, according to quality; calf heifers and young stock can be obtained at about half these prices. A dairy farm can thus be stocked for a comparatively small sum, and, as the returns are immediate, the butter factories

usually paying by cheque each week, there is little wonder that dairying is the most popular branch of farming for the man with small capital.

The profits from dairy herds vary considerably in accordance with the quality of the herd and the care and attention bestowed on their management. Many herds yield only about £6 per cow per year, but this amount is doubled when there is good management. In some districts a fair proportion of the herds return regularly year after year an average of £10 per cow per annum for cream sold to butter factories. In the case of mil'k farms furnishing the supply of the cities, the returns per cow are greatly in excess of those quoted.

The Department of Agriculture has recently undertaken a system of testing the pedigree herds throughout the State, whereby an accurate record of the milk yield and butter fat production of pure bred cows is obtained, and published as a guide to dairymen in the purchase of young pedigree bulls for mating with their ordinary dairy stock.

The chief adjunct to dairy farming, here as elsewhere, is the pig. Though almost every dairy farmer raises a few pigs each year, the demand for pork and bacon keeps the numbers from increasing. Indeed, during the past year the demand has been greater than the supply, with consequent rise in prices. The increase of dairy farming in recent years has been so rapid that pig breeders have not kept pace with the demand for suckers and store pigs. The remedy

Pigs. for this is that dairy farmers should make provision for breeding their own store pigs. Not only is there a fine demand for pig products for local consumption, but there is an illimitable market that would be opened up if pig production were increased to the extent of warranting the establishment of an export trade on the lines of the lamb trade. The Berkshire, Middle York, Large York, and Tamworth breeds are kept, and are popular in the order given. Crosses between the two former breeds are also very popular. There were 348,669 pigs held in 1912.

The fame of Australia generally, and Victoria in particular, for horse-breeding is world-wide; and, as the rural occupation in which most interest is taken and most sentiment felt, horse-breeding and horse keeping should, perhaps, have been given first place in dealing with the live stock

Horses. of the State. The Australian is proverbially fond of horses, and the practical manifestation of this partiality is seen in the advantage that is taken by all and sundry engaged in rural pursuits—from the squatter to the "cocky" farmer—of the ideal conditions existing for horse-breeding, whereby horses of every class are produced of a quality second to none for the purposes for which they are intended.

Two conditions have contributed in the past to the excellence of Australian-bred horses. In the first place, all the stock has descended from imported animals, which, in the nature of things, have been of good type, and approximately the best obtainable in the country of origin at the time of importation. Secondly, the climate, topography, and natural herbage of the country were well adapted to the rearing of horses. In the early days they were able to roam over large tracts of unfenced country growing abundance of feed, so that the pasture never became foul or horsesick. With these two conditions combined, it is not to be wondered at that horses of grand proportions and stout stamina were reared, and that they gained the



AWAITING EXAMINATION FOR SOUNDNESS AT A GOVERNMENT STALLION PARADE.

reputation of being the finest horses the world had ever known. Years back, however, and before the exportation of horses to India for Army purposes was established, prices became very low, and a consequent lessened interest in breeding was followed by deterioration and indiscriminate crossing. Many mobs of horses were allowed to run wild. These were the progeny of animals that had strayed through the absence of boundary fencing on large grazing blocks, and, having bred, the young ones grew up quite wild; otherwise there were no feral or indigenous horses in the country. These wild horses, or "brumbies" as they were called, were mostly light, wiry animals, and, on being captured for use, were found to be gritty and serviceable as stock horses—further evidence of the fine character of the country for rearing horses even when bred anyhow.

The days when horses were a glut in the market have, however, passed away, and with them the wild horses have gone out of existence. The land has become far too valuable for the rearing of inferior animals, and during recent years Victoria has resumed its position in the front rank of horse-breeding countries. At present, Victorian horses, whether of the light or heavy breed, command a value equal to that obtained for the same class in any country in the world.

The foundation of the light-horse stock of the State is the English thoroughbred. Many of the most noted animals whose names appear in the English thoroughbred stud book have been imported from time to time, including winners of the Two Thousand, Derby, and St. Leger. So well do Victorian conditions as regards pasture and climate suit the breeding of the thoroughbred horse that, not only has there been a maintenance of all the qualities of the breed, but in respect of size, bone, and stamina, there has been such improvement that Victoria has been able to send thoroughbreds to compete successfully with the parent stock at home in long-distance races, such as the Czarewitch Stakes. As regards the supply of thoroughbreds to India and other Eastern countries, both as sires and for racing purposes, Australian thoroughbreds are in much better demand than English-bred ones. They are, apparently, better able to stand the hard wear and tear of the Indian climate.

Considerable numbers of light horses, other than thoroughbreds, and also of middle weights and draught sorts for heavy gun purposes, are shipped to India every year. The main supply for the Indian War Office is obtained from Australia, and Victoria's share is still a considerable one, although not so great as it was previous to the Closer Settlement era and the extension of the railway system, whereby it has been made more profitable to use the land for other kinds of farming than to devote it exclusively to the breeding of horses.

Many farmers, however, especially in the wheat-growing areas, make draught-horse breeding a prominent section of their work. Wheat-growing and draught-horse breeding are a very payable and well-fitting combination. The breeding mares and the young horses from two to five years old are depended on to do the work of the farm, and the geldings and surplus mares are sold at four or five years old. It so happens that the foaling season (September and October) is the slackest as regards work on a wheat farm, and by the time the harvesting comes on (December) the foaled mares are

able to take a share in the work. During the last few years, since the policy of cutting up big sheep estates and devoting them to small farming operations has been adopted, there has been such a strong demand for draught horses for farm and irrigation work, that the market has been undersupplied, and prices accordingly have risen to an almost unhealthy pitch. Reasonably suitable farm horses can still be bought at from £25 to £35, but the better class of young draught geldings and mares are readily saleable at from £40 to £50. It is significant of the spirit of the farmers of Victoria that their prosperity is almost invariably shown in the character of their plough teams. After successfully surmounting the initial difficulties of settlement, the wheat farmer usually shows evidence of his prosperity by becoming "horse-proud," and aspiring to pre-eminence in his district in the matter of his draught horses, whether workers or for breeding. Sights such as make the true horseman's heart thrill with pleasure may be often seen in the Wimmera and Goulburn Valley districts during the ploughing season; half-a-dozen seven or eight horse teams, say, making their way majestically in front of a six-furrow plough through a mile long paddock; every team a matched one, a blaze-faced white-legged team of bays following a whole brown team, and, behind, a team of blacks, with bays again following: all well-conditioned and powerful, doing the work without any straining effort, and well within themselves. With heads up and ears cocked, their measured tread in unison with the "jinglety-jink" of the chains, they appear the embodiment, within their sphere, of the joy of life.

This all-round demand for first-class horses has resulted in an openly expressed feeling that nothing should be left undone that would tend to conserve or improve the standard of Victorian stock; and a very important step to this end was taken six years ago by the Government. In order to guard against deterioration of the present stock and to improve it for the future, the Government arranged for the free examination by the Government Veterinary Staff of all stallions standing for public service, and the issuing of a Government certificate of soundness and approval in respect of all sires found free from hereditary unsoundness and being of a reasonable standard as regards breed, type, and conformation. As most of the Agricultural Societies are subsidized by the Government, it was made one of the conditions for obtaining the subsidy that any stallion to win a prize at a show of the society must first have qualified for the Government certificate of soundness and approval. The horse parades held in the early spring are made use of as convenient occasions on which to conduct the examinations. Taking advantage of the attendance of horse breeders and farmers at parades, practical demonstrations and illustrated lectures are arranged to be given by the veterinary officers conducting the examinations. By this means useful information of a practical character is conveyed on breeding and stock management, the common ailments, unsoundness in stock, and cognate subjects. Some idea of the extent to which horse-breeding is carried on, and its profitable nature, may be gathered from the fact that there are 1,973 stallions in the State standing at the service of the public and holding the Government certificate. In 1912 there were 507,813 horses in the State.

While, as has been indicated, Victoria has extraordinary natural advantages for the breeding and rearing of live stock, it would be an unjustifiable omission

to fail to indicate that the disadvantages as regards stock diseases, which are such a serious incubus on the industry in many other countries, are almost absent here. Australia has absolutely no contagious disease

Health of Stock. of stock of local origin. No malignant contagious disease of horses, such as glanders, South African horse sickness, &c., has been introduced here. As regards other stock, the only introduced diseases of any moment are pleuro-pneumonia, swine fever, and anthrax, and in respect of these most districts of the State have a clean bill of health.

Agricultural Education in Victoria.

The scheme of Agricultural Educational Work carried out by the State may be summarized thus: --

- (1) *Agricultural Education* in Primary Schools and Agricultural High Schools.
- (2) *Agricultural Educational Colleges*—
 - (a) Longerenong.
 - (b) Dookie.
- (3) *University School of Agriculture*—

Diploma of Agriculture.
Bachelor of Agricultural Science
- (4) *Departmental Work*—
 - (1) *Lectures* by Experts—
 - (a) Subsidy Lectures.
 - (b) Farmers' Classes.
 - (2) *Experiment Plots*.
 - (3) *Agricultural Experiment Stations*.
 - (4) *Journal of Agriculture and Bulletins*.

(I) AGRICULTURAL EDUCATION IN PRIMARY SCHOOLS AND AGRICULTURAL HIGH SCHOOLS.

1. *Primary Schools*.—Two thousand primary schools are controlled by the Education Department, and upwards of 700 give regular courses in Agriculture and Nature Study. From the day the pupil enters the Primary School until he leaves, his attention is repeatedly being directed and focussed on natural objects. As the pupil passes towards the end of his primary career, he is taught the value of elementary experiments with plants and crops in the school-room and garden plot.

Agricultural High Schools.—From the Primary School the student passes to the Agricultural High School. There are ten of these schools—situate at Ballarat, Colac, Leongatha, Mansfield, Mildura, Sale, Shepparton, Warragul, Wangaratta, and Warrnambool—and to each a fully equipped farm comprising 20 to 85 acres is attached, also suitable laboratories. *Course*: One-third of the student's time is devoted to general studies, one-third to agricultural science and pure science, and one-third to practical farm work.

The object of the Agricultural High School is to bridge the gap existing between the agricultural instruction of the Primary School, and the courses at the Agricultural College. The object of the farms attached to the Agricultural High School is to demonstrate in the practice of the farm the application of the instruction received in the school.

The subjects of study at these High Schools are as follows :—Agricultural Chemistry, Physics, Botany, Zoology, English, Algebra, Geography (Commercial and Political), Arithmetic, Bookkeeping, Farm Carpentry, Drawing, and Practical Farm Work.

2. *Agricultural Colleges*.—By a special Act of Parliament in 1884 certain areas were reserved for the purpose of establishing Agricultural Colleges under the control of the Council of Agricultural Education. Two have been established—viz., Dookie College and Longerenong College. These farms give education to 100–150 students in scientific and practical agriculture. The course extends over three years at Dookie and two years at Longerenong, and the aim is to turn out efficient young farmers in all branches of the industry. In addition, considerable attention is devoted to experimental work in the breeding of wheats, and growth of new fodders, and to experiments with live stock, in horticulture, viticulture, &c.

3. *University School of Agriculture*.—The ascending grades of agricultural teaching in the Primary Schools, the High Schools and the Colleges, reach their culmination in the agricultural curriculum established at the University of Melbourne.

For the degree of Bachelor of Science, a four years' course of lectures, laboratory, and field work is prescribed, the subjects of study embracing physics, chemistry, biology, geology, veterinary subjects, mensuration and bookkeeping. Before beginning the course the candidate must pass the preliminary examination usual for undergraduates, or its equivalent. The University likewise grants a Diploma of Agriculture, for which a shorter three years' course is prescribed, and for which the preliminary examinations are less exacting.

4. *Departmental Activities*.—In addition to the facilities provided by the various educational authorities, instruction of a more directly practical nature is afforded by the Victorian Department of Agriculture. This is arranged in a large measure through the agency of the Agricultural and Pastoral Societies, of which over 100 are scattered throughout the State. The societies receive two options from the Department. Agricultural classes may be selected. For these a minimum enrolment of 30 is required, and the classes last over two weeks of five days a week, with demonstrations morning and afternoon, and four limelight lectures on different dates on special topics selected by the society from a list of about 40 subjects sent out to them. A minimum attendance of 15 is required for a lecture. During 1912, 15 classes and about 400 lectures were held by Departmental Officers in different parts of the country. To encourage societies in this work the Department grants a bonus of £10 for classes, and £5 for a course of lectures.

The Department also makes a grant to societies for the holding of competitions calculated to improve farm practice. A competition may be arranged for the best equipped farm, the best managed crop, the best milking herd, or other similar subject. The competitions are usually judged by an Officer of the Department, whose duty it is to furnish comments and recommendations, either in the form of a report or a lecture to the members of the society holding the competition. These competitions are rather popular.

Besides engaging in lecturing and advisory work among farmers, the Department of Agriculture is extensively engaged in demonstration work and original research. For this purpose it owns and manages farms where technical and commercial questions affecting agriculture can be investigated under field conditions.

The Journal of the Department of Agriculture is published monthly at a price of 3s. per annum. It has a circulation of upwards of 10,000 monthly. The contents are contributed by the staff of the Department, and comprise in each issue information suitable to the season. While the articles are not strictly confined to the experiences of the departmental staff and the results

Journal of Agriculture. of their work as departmental officers, the contributions are almost entirely original. With the exception of a page or so of notes each month, no extract matter is used except under very exceptional circumstances. The Journal thus becomes a record of the work and teachings of the Department from year to year. The contribution of articles in series by the staff is encouraged, and these, together with any other articles of permanent suitability, are subsequently published separately as departmental bulletins.

The Journal is distributed free to official institutions throughout the Commonwealth, to the High Schools and State Schools of Victoria, and to a large number of officials, societies, and institutions in Europe, America, and other parts of the world. Its main circulation is, of course, amongst the farmers of the State, and it is frequently used as a means of communication of notices, lecture programmes, and such like between the Department and the farmers.

Department of Agriculture.

This Department is controlled by a Minister of the Crown, and has a large staff of experts, with a Director at the head. These are actively engaged in supervising all matters relating to the agricultural, pastoral, fruit-growing, and dairying industries of the State, and in giving instruction to those engaged therein. As stated above, the Department publishes a monthly Journal

The Department is divided up, for administration purposes, into three divisions, viz., Agricultural, Live Stock, and Produce Divisions.

1. Agricultural Division.

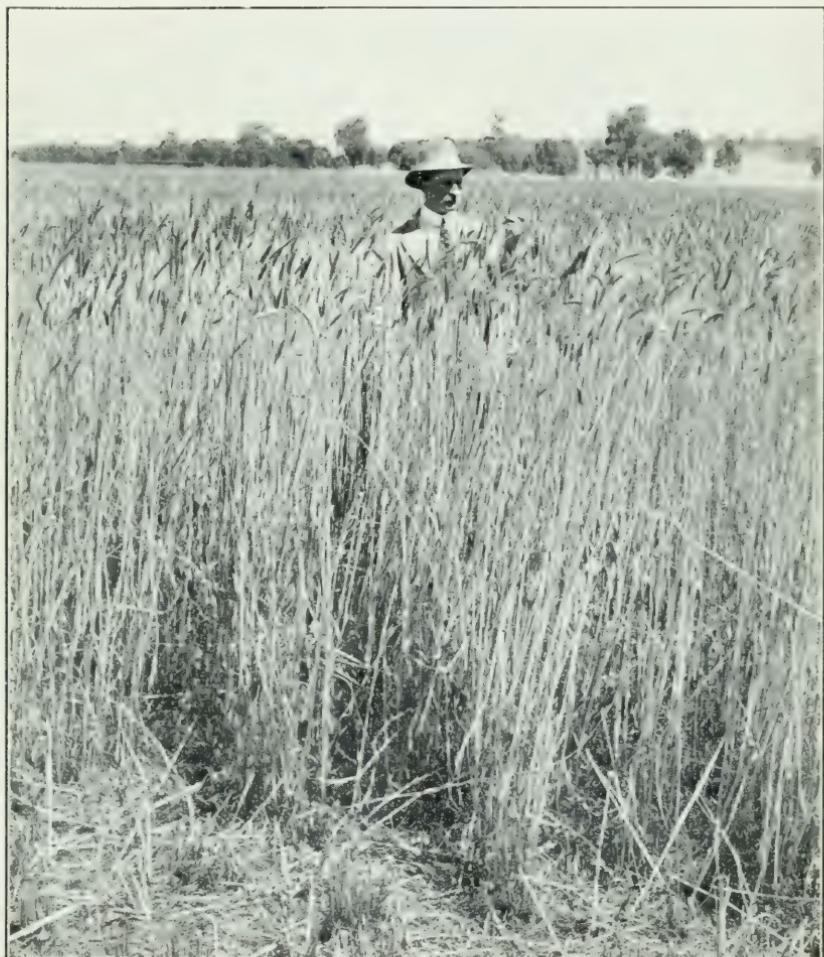
This Division comprises the following branches —

1. Experiment Farms.
2. Chemist's Branch.
3. Science Branch.
4. Field Branch.
5. Horticultural Branch.
6. Farmers' Classes—Lectures.

The objective of the Division is briefly to assist in raising the standard of cultivation and production in every part of the State where agriculture is carried on, by means of demonstration plots, Demonstration and Experiment Farms, regular courses of lectures, periodical visits, and inspections by expert officers, and by the distribution of pamphlets, bulletins, &c., bearing directly on the work of the farmer. Investigations of plant diseases and of soil and manurial problems are also a marked feature of the work of the Division.

These farms were established in various parts of the State with the object of carrying out research work, experiments, and practical demonstration in all branches of agriculture and live stock husbandry.

Experiment Farms. The purpose of the farms is not to attain financially profitable results, but to confer on agriculture the benefits of modern scientific advances by



THE POPULAR WHEAT OF AUSTRALIA.—A FINE CROP OF "FEDERATION" WHEAT AT THE RUTHERGLEN EXPERIMENT STATION, 1913.

the prosecution of investigations and trials under practical and accurately recorded conditions concerning the problems involved in increasing the agricultural output of the State, particularly as regards the—

- (1) Improvement of wheat and other cereals, grasses, and economic plants by selection, stud-breeding, and hybridizing.
- (2) Soil renovation, fertilizing, and tillage practices.

- (3) Rotation of crops and improved cropping practices.
- (4) Improvement of natural pastures and trials of artificial grassing with exotic and native grasses.
- (5) The breeding and feeding of live stock, improved milk yields, and production of standard types of lambs for export.
- (6) Researches concerning soil moisture, temperatures, biological conditions and nitrifying processes, and nutrition of plants.
- (7) Meteorological observations relating to agriculture.
- (8) Irrigation practices, drainage, and aeration of soil.
- (9) Orchard experiments, production of new varieties, and combating diseases.
- (10) Vineyard practices, the establishing of resistant vines and methods of manuring, culture, and wine making.



GATHERING OF 700 FARMERS ON "FARMERS FIELD DAY" AT CENTRAL RESEARCH FARM, WERRIBEE.

There are four main farms, at Werribee, Rutherglen, Wyuna, and Bamawm and a School of Horticulture at Burnley within three miles of Melbourne.

THE WERRIBEE FARM is situated 20 miles from Melbourne, in a rather dry area, and the soil is typical of a large amount of the Goulburn Valley land. The farm has only been in existence for twelve months, and already a considerable amount of work has been done. Experimental plots have been laid out and comprise—

- (1) The best system of rotation for the district and State. This is being accomplished in 26 half-acre plots, comprising 10 different systems of farming, and accurate records will be kept and published from time to time.

- (2) (a) Cereal experiments, including stud cereals, selection, and crossbred plots. A complete collection of standard Australian varieties have been sown, and new crossbred varieties are being tested and compared with Federation (the standard variety); (b) the crossing of varieties to produce wheats of better quality and yielding properties.
- (3) Pot experiments, which are in full swing, and whose purpose is to determine the water requirements of our several Victorian crops and the amount of water required by wheat, barley, oats, lucerne, and rape at various stages of growth from germination to maturity; also to determine the transpiration through the leaves at different periods.

Permanent Fertilizer Trials.—These comprise a series of 40 plots, of which 21 are to be cropped in alternate years and the remainder fallowed and sown to green crops. They will demonstrate the best manures or mixtures of manures suitable for the district; also the most payable rate at which to apply them.



GRADING LAND FOR IRRIGATION AT CENTRAL RESEARCH FARM, WERRIBEE.

Green Manurial Trials and Feeding-off Tests.—Owing to the depletion of humus at the farm it was found necessary to evolve a method for supplying this in the quickest and cheapest manner. Two methods are being tried at present—feeding-off green crops and ploughing in similar crops. There are twenty plots, ten of which will be alternately under wheat each year while the others will be under various crops, and two check fallow plots.

The value of the fodder obtained in feeding off will be obtained by weighing the sheep on and off the plots, and making allowance for wool, &c.; also careful records of the increased yield of wheat in the ensuing year will be kept.

Improvement of Natural Pastures.—The natural pasture on the farm is poor, and of low stock-carrying capacity. The quality of the herbage growing in the district is largely dependent on the quality of soil. Whether the stock-carrying capacity of the soil can be materially and profitably improved by top-dressing with various manures is the object of this experiment. Another method of improvement is being tried by the sowing of exotic grasses and clovers.

Irrigation Trials.—An area of 50 acres has been sown with lucerne, and several trials are being carried out with this important crop. Amongst others, are inoculation and liming tests, variety tests, rate of seeding trials, and fertilizer trials, and top-dressing of lucerne with manures. The whole area has been laid out in rectangular checks to facilitate watering and harvesting. The main checks are 1 chain apart, and the cross checks $\frac{1}{2}$ chain.

Live Stock Tests.—An experiment is now in progress to determine the suitability of the various English breeds of sheep to produce quick maturing and well fleshed lambs for export when crossed on large-framed ewes, viz., Lincoln-Merino first cross ewes, the most commonly bred half-breeds in Victoria. The rams used include English Leicester, Border Leicester, Lincoln, Dorset Horn, Shropshire, and South Down.



PERMANENT TRIALS OF ROTATION CROPPING AT RUTHERGLEN EXPERIMENT STATION.

Other experiments are in progress, such as the determination of the movement of soil moisture and nitrates, when the land is—(1) under crop, (2) worked fallow, (3) neglected fallow, and (4) pasture, by taking soil samples and analysing them monthly.

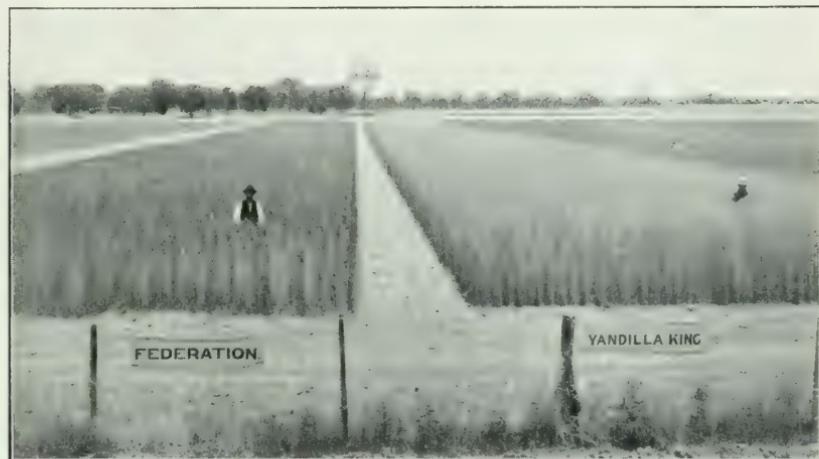
RUTHERGLEN EXPERIMENT STATION.—At this station similar experiments to those at Werribee are being carried out, viz. :—

- (1) Manurial Tests.
- (2) Rotation of crops.
- (3) Seed Selection tests.
- (4) Variety Cereal tests.
- (5) Feeding-off and Forage experiments.

- (6) Cultivation experiments.
- (7) Improvement of Wheat.
- (8) Acclimatization tests.
- (9) Scientific tests, viz. :—
 - (a) Water requirements of various crops.
 - (b) Movement of soil moisture.
 - (c) Nitrification tests.
 - (d) Sources of gain and loss to the soil.

The cultivation tests were designed to solve such problems as the depth of ploughing, the merits of subsoiling, various methods of fallowing and cultivation and green manuring.

The variety and selection tests produce a considerable amount of seed, and this is disposed of to the farmers in small lots for the improvement of the seed wheat of the country.



TESTING VARIETIES OF WHEAT FOR PROLIFICACY AT RUTHERGLEN EXPERIMENT STATION.

WYUNA IRRIGATION FARM.—This comprises 540 acres, of which the greater portion is poor plain country unsuited for irrigation. Experimental work falls into two divisions—

- (1) Irrigation investigations.
- (2) Dry farming experiments.

(1) *Irrigation Work.*—Plots have been laid down to test the value of cultivating the growing lucerne crop and to demonstrate the relative merits of different forms of culture.

Manurial Problems.—Under irrigation conditions, i.e., determining the value of phosphoric acid in various forms, the most profitable rate of applying each; also the benefits obtained by using lime in different forms and the rates of application.

Forage Crops.—Twenty acres have been laid to test the value of various summer and winter forages; also grasses and clovers.

Other experiments include the evolution of a suitable rotation for irrigated lands, in which important root crops, *e.g.*, potatoes, onions, mangolds, fodder crops, and legumes will form a prominent part.

Steps are also taken to secure data regarding the quantity of water required by various irrigated crops under diverse systems of culture and soil treatment.

(2) *Dry Farming.*—The dry farming experiments are similar to those carried out at Rutherfurd and Werribee.

In addition to conducting trials of various wheats already alluded to, with a view to ascertaining the yielding properties of different kinds, the Department has in view the introduction of varieties having superior milling properties to those now in use. Up to the present time, the milling value has not concerned the farmer very much, but in time the value of wheat will be based on its strength and percentage of flour.

In order to carry out co-related investigations upon this side of the wheat industry, the Department of Agriculture has installed a miniature flour-milling plant to test all varieties.

BURNLEY SCHOOL OF HORTICULTURE.—This institution, comprising 17 acres of a Government reserve within 3 miles of the Melbourne Post Office, has been in existence for a number of years, and has been extended from time to time until now tuition may be obtained on all subjects pertaining to Horticulture, and, in addition, on Bee-keeping, Poultry Raising, Fruit Drying and Preserving, &c.

In addition to the ordinary curriculum, free lectures and demonstrations on various subjects are held from time to time. These enable persons desirous of obtaining information on one subject only to do so without the necessity of paying for a full course of instruction.

In conjunction with the school, there are large gardens and orchards, which serve for field instruction and demonstrations, and for practical training in horticulture. Scholarships are granted, which enable students to continue their studies at the Botanical Gardens.

Special provision has been made for instruction to women desirous of studying horticulture, and numbers have already availed themselves of this provision.

The functions of the Chemist's Branch are:—

**Chemists'
Branch.**

- (1) To administer the Artificial Manures Act, and to see that farmers are protected against fraud and adulteration in purchasing artificial manures.
- (2) To analyze soils submitted by the public, and to offer helpful advice on the mode of treatment of such soils to make them more productive.
- (3) To conduct laboratory investigations on specific problems bearing directly on the improvement of farm practice.
- (4) To make such analyses of butter, cheese, and other farm products as will lead to an improved quality in manufactured products.

The work of the Laboratory also includes investigations and analyses of soils, manures, fodders, water, and milk for the benefit of the settlers. Advice is tendered as to suitable manures to apply for soil deficiencies noted by analysis.

An examination of the manures retailed throughout the country districts is made yearly for the purpose of detecting adulteration.

The work further embraces an examination of waters as to suitability for stock, domestic, or irrigation use, and reporting on same; also an examination of all products grown on the soil as occasion demands.

The Science Branch includes Botany, Entomology, Vegetable Pathology, and Biology. The general aim of this Branch is to assist farmers by directing their attention to the pests and diseases which attack various farm crops and animals, and to offer such advice as will be helpful in preventing losses of stock and crops.

THE GOVERNMENT BOTANIST controls the National Herbarium, Melbourne, which contains over a million sheets of plant specimens arranged and listed for reference, and comprising not only a unique collection of the Australian flora, and New Zealand, Papuan, and Polynesian collections, but also a very large collection of the plants of the whole world, in which American, South



BREAKING VIRGIN COUNTRY.

African, Indian, and Malayan plants are especially strongly represented. In fact, in some cases, owing to the purchase of the Sonder and other collections, the Herbarium possesses type and co-type specimens of the flora of other countries, notably from South Africa in regard to flowering plants, while, in regard to Algae, it contains type specimens from Kutzng and others. The character and scope of the Herbarium is therefore such as to make it a centre of reference in regard to Australian plants generally, and also to give it an international standing.

The special economic importance of the large non-Australian collection is to render possible the rapid identification of newly-introduced plants, such as always tend to appear in abundance when new countries are in process

of being opened up to civilization. The Herbarium identifies all plants sent in for examination, and gives information in regard to them free of charge.

The investigation of scientific problems in connexion with plant life is rendered easier than it otherwise would be by the existence of a good, though mainly systematic library, comprising some 9,000 volumes.

It is of importance to a settler in a new country who finds himself surrounded by a flora of whose names and properties he is entirely ignorant, that he should be able to obtain information when necessary as promptly and expeditiously as possible in regard to the new plants surrounding him, since the absence of such knowledge may often cause him considerable loss or waste of effort.

THE VEGETABLE PATHOLOGIST identifies fungoid pests attacking farm crops, vegetables, and fruit trees, and prescribes methods for overcoming these pests. He also furnishes to farmers, fruit-growers, and others, entirely free of cost, information regarding diseases affecting crops, and undertakes methods of control.

THE ENTOMOLOGIST performs a like service with regard to noxious and destructive insects, his work mainly comprising—

- (1) Destruction and control of insect pests.
- (2) Identification and classification of insects.
- (3) Advising farmers, horticulturists, orchardists, and the public generally *re* No. 1.
- (4) Field and other experiments with insecticides.
- (5) Breeding insects that are parasitic on the injurious species.
- (6) Instruction in economic entomology and ornithology by means of lectures, field excursions, and literary articles.

THE BIOLOGIST investigates the diseases wrought by bacterial foes, and deals with the means of overcoming them.

The Field Branch assists settlers by the following means :—

- Field Branch.**
- (1) Carrying out experiments and demonstrations on plots on private farms to show the variety of wheat, oats, barley, roots, &c., best adapted to local conditions, also the kinds and quantities of manures and fertilizers that can be most profitably applied to various crops, and the cultural practices most likely to lead to success.
 - (2) Giving advice on the cultivation and utilization of various farm crops by correspondence and personal visits, and by lectures under the auspices of the local Agricultural Societies.
 - (3) Many of the Agricultural Societies hold farm competitions each year with the object of encouraging farmers in the districts to improve their methods of cultivation. The judges of these competitions are usually members of the Field Branch, and these officers are thus enabled to come into close contact with the farmers of the district and assist them in their work.

- (4) Officers with an expert knowledge of such special crops as tobacco, flax, potatoes, and scent plants, have been appointed by the Department to encourage the growing of these crops.

The work performed by the Horticultural Branch covers Orchard Supervision, Fruit-growing, Fruit Inspection, and the control of the marketing and export of fruit is carried out by the Produce Division.

Horticultural Branch. THE FRUIT INSPECTION SECTION deals with all matters in connexion with the marketing of the produce (advice *re* packing, suitable markets, requirements of other States and oversea countries, &c.), while at the various Government Cool Stores growers may keep in storage their surplus fruit until such time as they can obtain a suitable market.

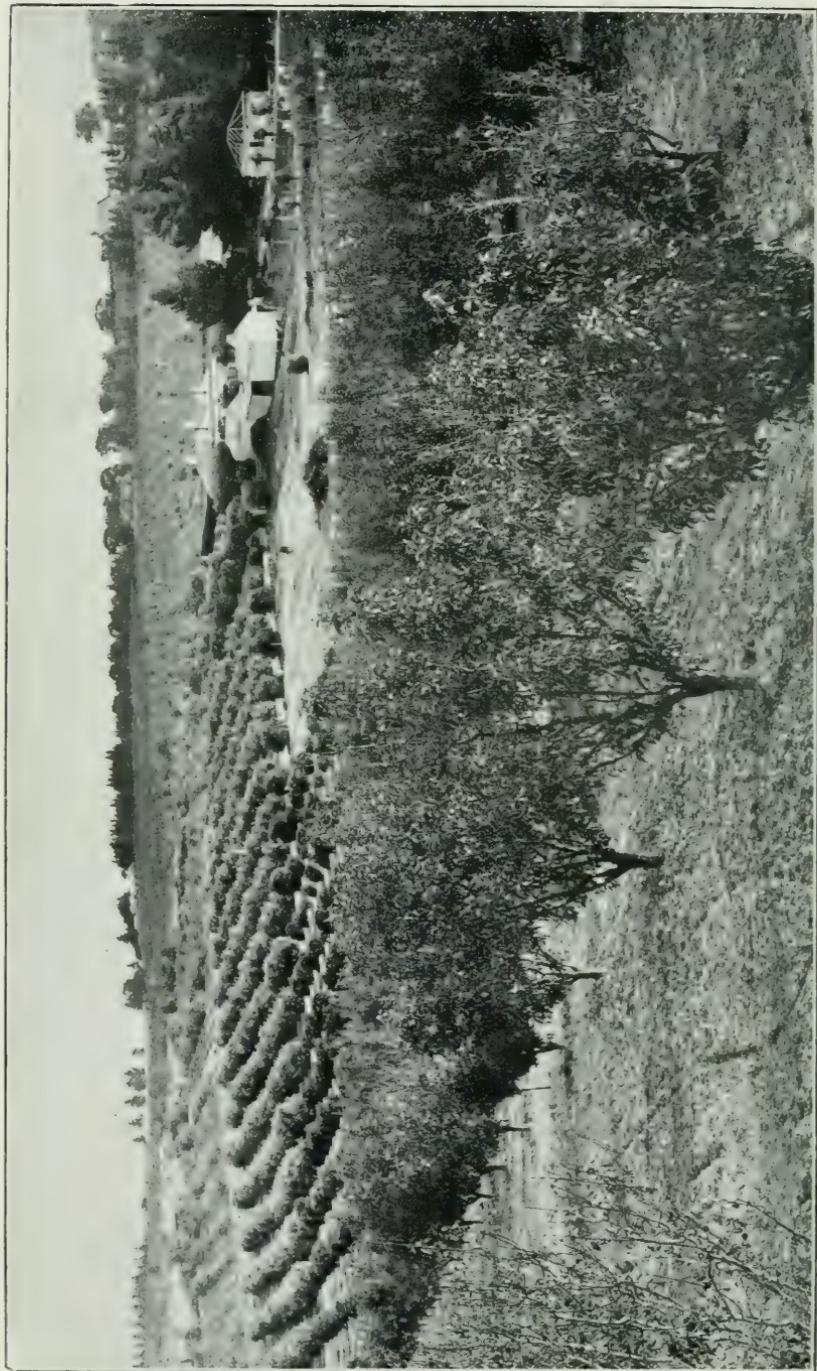
ORCHARD SUPERVISION.—The duties carried out by the Orchard Supervisors (twelve in number, one located in each of the fruit-growing districts of the State) may be summarized as under :—

- (1) Advising intending growers respecting the most suitable localities, varieties of fruits, &c.
- (2) Advising growers and inquirers *re* methods of planting, pruning, cultivation, &c.
- (3) Advising respecting treatment and methods of eradicating disease.
- (4) Inspecting orchards and gardens and enforcing the provisions of the Vegetation Diseases Acts.
- (5) Lecturing on the various branches of horticulture and on insect and fungoid pests, and the best methods of dealing with same.

VITICULTURE.—The Viticultural Section bears practically the same relation to the viticultural industry as the Orchard Supervision Section does to fruit-growing. In addition, however, to the items mentioned, viz., constitution, cultivation, treatment of disease, &c., the Government Viticulturist advises vigneron's on all matters pertaining to wine-making. Experimental work is carried out at the Rutherglen Viticultural College, and, under departmental supervision, at some of the private vineyards.

Some years ago practically the whole of the vineyards in Victoria suffered severely from the ravages of phylloxera. Since then, the work of reconstitution of vineyards has been sustained to such an extent that the majority of vineyards are now planted, in part at least, with phylloxera-resistant varieties. Large quantities of phylloxera-resistant stocks are raised annually at the Rutherglen Viticultural Station and supplied to growers at about one-third the cost of production. Phylloxera-resistant rootlings were distributed in 1912, to the number of 240,000, at the low price of £4 per thousand.

The Government Viticulturist, in order that he might be as fully acquainted as possible with the methods followed in the most noted European wine-producing districts, recently visited Europe and collected a mass of information of a nature likely to prove of service to Victorian growers.



A FLOURISHING ORCHARD DISTRICT.

2. Live Stock Division.

The three main branches of this Division are *Dairy Supervision*, *Stock Inspection*, and *Veterinary*. In addition, the staff includes the Cheese Expert, Poultry Expert, Bee Expert, and Silo Supervisor.

The work of the Division may best be set out under the following heads :—

1. Dairy Supervision.
2. Stock Diseases.
3. Stallion Examination.
4. Sheep Industry.
5. Pig Industry.
6. Poultry Industry.
7. Cheese Industry.
8. Honey Industry.
9. General.

The Milk and Dairy Supervision Act, which came into operation in June, 1906, provides for the inspection of dairies and dairy herds in districts defined by proclamation under the Act. Each district is under the control of a Dairy Supervisor, versed in all aspects of dairy farm operations, who passes

Dairy Supervision. a searching examination before appointment. His duties are to become acquainted with every dairy farmer, to confer with and give him advice in regard to the better methods of producing milk or dairy produce, and to inspect premises, utensils and animals; also to encourage him in improving the methods of cultivation of fodder crops, in the purchasing and breeding of dairy cows, in testing and culling, and in the construction of farm buildings.

At the present time, 160,000 dairy cows are under dairy supervision—an average of 13·67 per dairy farm. The average daily yield per cow, while milking for a period of nine months, is 6·6 quarts.

When cows on a dairy farm are found to be suffering from some condition which, in the opinion of the Supervisor, is suspicious of disease and likely to be deleterious to the milk supply, the cow is prohibited from use for a period of fourteen days, during which time a Veterinary Officer makes an inspection, and determines that the prohibition shall either be removed and the cow returned to the dairy herd; or extended if the condition is one of transient character; or made permanent if the condition so warrants.

A scheme has recently been introduced for the purpose of testing pure-bred herds of the State, and for the issue of a Government certificate to those animals that yield a given amount of butter fat per annum.

This State is one which is particularly free from contagious diseases. **Stock Diseases.** There have been only three outbreaks of swine fever during the last two years. Anthrax occurs in isolated areas only, and the outbreaks are few. Pleuro-pneumonia outbreaks average about four or five per annum.

The procedure for the prevention of the introduction of disease from oversea into Victoria is carried out by the Veterinary Officers of this Division under the Commonwealth Quarantine Act. Stock are only permitted introduction

from Great Britain and America, and have to carry the necessary certificates of health, and undergo a period of quarantine on arrival in the State.

Stallion Examination. The certification of stallions, after examination, is carried out by the Veterinary Officers of this Branch.

An expert is attached to the Branch, whose duties are to lecture and demonstrate upon all phases of the industry, and breeding for both wool and carcase production.

Sheep Industry. This industry is one which is being entered in by a large number of farmers and small land-holders. Lamb-raising blends well with wheat and cereal growing, and has become a regular and increasingly marked feature of mixed farming. Hence the necessity of having reliable information and advice readily available to those entering on the industry.

For the past few years the pig industry has been in an unsatisfactory position, owing to the high prices of foodstuffs and the low price ruling for products. The amount of bacon produced in Victoria last

Pig Industry. year was 20,094,206 lbs., valued at £792,499. Victoria being essentially a dairying country, there is room for great improvement on this; and this State should be able to obtain a larger portion of the £24,000,000 that is paid by Great Britain for pig products.

Lectures are given throughout the State on feeding, breeding, and general management of pigs.

This industry is one which has great possibilities ahead of it—the average price of eggs throughout the year being 1s. per dozen. Egg-laying competitions are held annually by the Department, with the result

Poultry Industry. that a considerable amount of enthusiasm has been induced and better methods of breeding and management are being followed. The second best world's record for egg-laying was gained in the 1911-12 competition. Two Poultry Experts are engaged; and the whole of their time is occupied in lecturing throughout the country.

Last year 4,176,778 lbs. of cheese were manufactured in Victoria. More attention is gradually being paid to the industry, the services of the Cheese

Cheese Industry. Expert attached to the Branch being eagerly sought for by cheesemakers throughout the State. The instruction given by this officer is very thorough. He remains on the farm for three or four days to demonstrate the manufacture through all stages. As a result, considerable improvement is reported in the quality of the article now produced.

A Bee Expert is attached to the Branch, whose duties are to encourage the keeping of bees under proper conditions. This is done by means of inspections under the Bee Diseases Act.

Honey Industry. The latest figures available show 52,723 bee-hives, producing 3,277,590 lbs. of honey and 45,354 lbs. of beeswax. The average estimated return per hive is 20s.; in many cases, however, 80s. per hive is obtained per annum.

The staff consists of the Chief Veterinary Officer (in charge of Branch), 6 Veterinary Officers, 42 Dairy Supervisors, 13 Stock Inspectors, 7 Experts, and a clerical staff of 12. The services of the **General** whole staff are always available to advise and assist farmers on any portion of the industries which have been referred to.

Additional functions of the Branch are the administration of the Shearers' Hut Accommodation Act, and the Sheep Dipping Act. The former provides that shearers shall be supplied with proper accommodation, under sanitary conditions; the latter that sheep, except under certain conditions, shall be dipped annually, and that sheep found infested with ticks or lice shall not be exposed for sale.

The Veterinary Staff gives information to farmers on questions relating to the health and management of stock, and large numbers of replies to queries are despatched annually.

The appended table gives particulars of the area under tillage and **Summary of Production.** the production of the State for a number of years past, usually fifteen years:—

SUMMARY OF PRODUCTION SHOWING THE PROGRESSIVE INCREASE IN PRODUCTION OF STAPLE CROPS DURING THE LAST FIFTEEN YEARS.

Area under Tillage in Victoria, 1897-1913, showing Quinquennial Totals and Averages.

Year.	Area under Tillage	Year.	Area under Tillage
	acres.		acres.
1897 .. .	2,925,416	1904 .. .	4,021,590
1898 .. .	3,144,574	1905 .. .	4,175,614
	—	1906 .. .	4,269,877
	6,069,990	1907 .. .	4,294,553
	—	1908 .. .	4,126,823
		Total .. .	20,888,457
		Annual Average	4,177,691
1899 .. .	3,727,765	1909 .. .	4,496,183
1900 .. .	3,668,556	1910 .. .	4,834,285
1901 .. .	3,717,002	1911 .. .	5,336,247
1902 .. .	3,647,459	1912 .. .	5,109,849
1903 .. .	3,738,873	1913 .. .	5,706,579
Total .. .	18,499,655	Total .. .	25,483,143
Annual Average	3,699,931	Annual Average	5,096,628

Summary showing Progressive Increase in Production during the last
Fifteen Years—*continued.*

Yields of Wheat in Victoria, 1896–1912, showing Quinquennial Totals and Averages.

			Year.	Production of Wheat.
				bushels.
1896	..	..	7,091,029	
1897	..	..	10,580,217	
			17,671,246	
1898	..	..	19,581,304	1898
1899	..	..	15,237,948	1899
1900	..	..	17,847,321	1900
1901	..	..	12,127,382	1901
1902	..	..	2,569,364	1902
Total		..	67,363,319	Total
				..
Annual Average			13,472,664	32,349,679
1903	..	..	28,525,579	1903
1904	..	..	21,092,139	1904
1905	..	..	23,417,670	1905
1906	..	..	22,618,043	1906
1907	..	..	12,100,780	1907
Total		..	107,754,211	Total
				..
Annual Average			21,550,842	40,917,868
1908	..	..	23,345,649	Annual Average
1909	..	..	28,780,100	8,183,573
1910	..	..	34,813,019	
1911	..	..	20,891,877	
1912	..	..	26,223,104	
Total		..	134,053,749	
Annual Average			26,810,749	Total
				..

Yields of Oats Grown in Victoria, 1898–1912, showing Quinquennial Totals and Averages.

			Year.	Production of Oats.
				bushels.
1898	..	..	5,523,419	
1899	..	..	6,116,046	
1900	..	..	9,582,332	
1901	..	..	6,724,900	
1902	..	..	4,402,982	
Total		..	32,349,679	
Annual Average			6,469,935	
1903	..	..	13,434,952	
1904	..	..	6,203,429	
1905	..	..	7,232,425	
1906	..	..	8,845,654	
1907	..	..	5,201,408	
Total		..	40,917,868	
Annual Average			8,183,573	
1908	..	..	11,124,940	
1909	..	..	7,913,423	
1910	..	..	9,699,127	
1911	..	..	4,585,326	
1912	..	..	8,323,639	
Total		..	41,646,455	
Annual Average			8,329,291	

Summary showing Progressive Increase in Production during the last
Fifteen Years—*continued.*

*Yields of Barley in Victoria, 1898–
1912, showing Quinquennial Totals
and Averages.*

Year.	Production of Barley.
	bushels.
1898	1,112,567
1899	1,466,088
1900	1,215,478
1901	693,851
1902	561,144
Total ..	5,049,128
Annual Average	1,009,825
1903	1,218,003
1904	874,099
1905	1,062,139
1906	1,255,442
1907	1,058,295
Total ..	5,467,978
Annual Average	1,093,595
1908	1,511,181
1909	1,023,384
1910	1,340,387
1911	1,024,584
1912	1,744,527
Total ..	6,644,063
Annual Average	1,328,812

*Yields of Potatoes in Victoria, 1898–
1912, showing Quinquennial Totals
and Averages.*

Year.	Production of Potatoes.
	tons.
1898	161,142
1899	173,381
1900	123,126
1901	125,474
1902	168,759
Total ..	751,882
Annual Average	150,376
1903	167,736
1904	92,872
1905	115,352
1906	166,839
1907	135,110
Total ..	677,909
Annual Average	135,581
1908	152,840
1909	174,970
1910	163,312
1911	119,092
1912	191,112
Total ..	801,326
Annual Average	160,265

Summary showing Progressive Increase in Production during the last Fifteen Years—*continued*.

Quantities of Butter Made for Fifteen Years, showing Quinquennial Totals and Averages.

Year.	Butter Made.
	tons.
1898	15,536
1899	23,807
1900	24,823
1901	20,919
1902	17,512
Total ..	102,597
Annual Average	20,519
1903	20,842
1904	27,233
1905	25,717
1906	30,397
1907	28,458
Total ..	132,647
Annual Average	26,529
1908	21,635
1909	24,628
1910	31,520
1911	38,616
1912	30,204
Total ..	146,603
Annual Average	29,320

Quantities of Cheese Made for Fifteen Years, showing Quinquennial Totals and Averages.

Year.	Cheese Made.
	tons.
1899	2,015
1900	1,913
1901	1,774
1902	1,719
1903	2,536
Total ..	9,957
Annual Average	1,991
1904	2,119
1905	1,919
1906	2,177
1907	1,964
1908	1,932
Total ..	10,111
Annual Average	2,022
1909	2,243
1910	2,023
1911	2,031
1912	1,864
1913	1,988
Total ..	10,149
Annual Average	2,030

Summary showing Progressive Increase in Production during the last
Fifteen Years—*continued.*

*Quantities of Fruit Exported to
Overseas Countries from 1899 to
1913, showing Quinquennial Totals
and Averages.*

Year.	Fruit Exported.
	cases.
1899	16,448
1900	11,649
1901	36,050
1902	43,328
1903	87,993
Total ..	195,468
Annual Average	39,094
1904	51,459
1905	58,511
1906	59,670
1907	139,009
1908	102,484
Total ..	411,133
Annual Average	82,226
1909	204,678
1910	162,357
1911	297,400
1912	305,518
1913	398,269
Total ..	1,368,222
Annual Average	273,644

Exports of Butter to Overseas Countries from Victoria for Fifteen Years, showing Quinquennial Totals and Averages.

Year.	Butter Exported.
	tons.
1897	7,175
1898	9,744
1899	17,107
1900	16,163
1901	11,152
Total ..	61,341
Annual Average	12,268
1902	8,565
1903	14,736
1904	16,181
1905	18,140
1906	21,562
Total ..	79,184
Annual Average	15,837
1907	15,216
1908	9,402
1909	15,902
1910	25,154
1911	20,234
Total ..	85,908
Annual Average	17,182

Summary showing Progressive Increase in Production during the last
Fifteen Years—*continued.*

Exports of Mutton and Lamb from Victoria for the last Fifteen Years, showing Quinquennial Totals and Averages.

Number of Sheep and Lambs Slaughtered for Fifteen Years, showing Quinquennial Totals and Averages.

Year.	Mutton and Lamb Exported. carcasses.	Year.	Sheep and Lambs Slaughtered. No.
1899	473,154	1899	1,752,272
1900	287,477	1900	2,371,415
1901	512,321	1901	2,469,797
1902	354,708	1902	2,827,938
1903	275,290	1903	2,652,569
Total ..	1,902,950	Total ..	12,073,991
Annual Average	380,590	Annual Average	2,414,798
1904	302,539	1904	2,305,729
1905	551,938	1905	2,576,316
1906	870,048	1906	2,826,144
1907	840,892	1907	3,226,141
1908	738,465	1908	3,309,865
Total ..	3,303,882	Total ..	14,244,195
Annual Average	660,776	Annual Average	2,848,839
1909	836,324	1909	3,708,512
1910	1,539,460	1910	4,245,881
1911	1,563,599	1911	4,348,363
1912	1,524,688	1912	4,153,269
1913	1,991,342	1913	4,602,007
Total ..	7,455,413	Total ..	21,058,032
Annual Average	1,491,083	Annual Average	4,211,606

Summary showing Progressive Increase in Production during the last
Fifteen Years—*continued.*

*Number of Cattle Slaughtered for
Fifteen Years, showing Quin-
quennial Totals and Averages.*

*Number of Pigs Slaughtered from
1900 to 1911.*

Year.	Cattle Slaughtered.	Year.	Pigs Slaughtered.
	No.		No.
1897 .. .	219,436	1900 .. .	231,752
1898 .. .	211,196	1901 .. .	261,479
1899 .. .	229,371		
1900 .. .	248,797		493,231
1901 .. .	251,477		
Total .. .	1,160,277		
Annual Average	232,055	1902 .. .	224,431
		1903 .. .	164,745
1902 .. .	233,206	1904 .. .	191,311
1903 .. .	235,284	1905 .. .	248,568
1904 .. .	243,937	1906 .. .	274,391
1905 .. .	249,454	Total .. .	1,103,446
1906 .. .	261,034	Annual Average	220,689
Total .. .	1,222,915		
Annual Average	244,583		
1907 .. .	289,709	1907 .. .	257,695
1908 .. .	281,087	1908 .. .	225,162
1909 .. .	287,548	1909 .. .	210,613
1910 .. .	319,665	1910 .. .	257,287
1911 .. .	347,926	1911 .. .	345,547
Total .. .	1,525,935	Total .. .	1,296,304
Annual Average	305,187	Annual Average	259,260

FORESTRY IN VICTORIA.

By H. Mackay, Conservator of Forests.

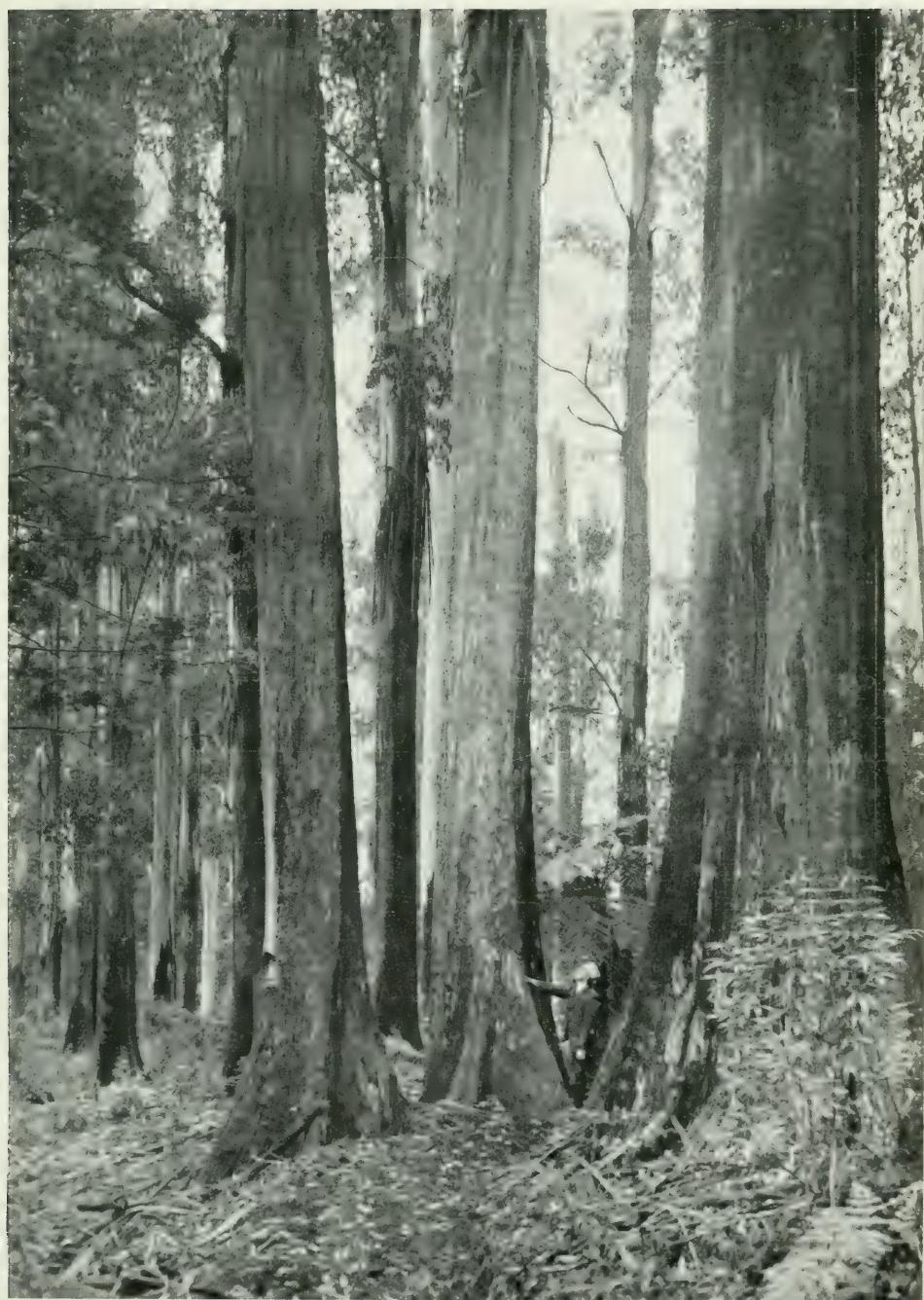
The true aim of forestry is the preservation of the forests of a country by wise use. In practice, it embraces a knowledge of rocks and soils, the food of the plant life which covers them; of botany, the knowledge of vegetable living bodies; of chemistry, the science which reveals the nature and properties of bodies; and of sylviculture, the rational treatment and working of forest areas, so as to maintain them in a timber-yielding condition. It includes also planting and sowing where Nature has clothed the surface of a country with niggard hand, or where, by the action of man or the ravages of fire or tempest, areas have been denuded of tree vegetation and rendered unprofitable. But the primary function of the forester in a newly-settled country is to maintain and increase the sylvan wealth with which Nature has clothed hill, valley, and plain, by regulating and correcting wasteful or inferior growth, while at the same time carefully restricting the yearly output of timber and other produce to such quantity as the forest can safely yield without deterioration.

FOREST AREAS AND WORKING PLANS.

Victoria, with a total area of 56,245,000 acres, has about 12,000,000 acres of woodland. Of the latter, over 4,000,000 acres are set aside as climatic reserves and for the production of timber, about 3,800,000 acres being formally dedicated in perpetuity for the purpose of forest and water supply. Of the State forest domain, some 2,500,000 acres are situated on the slopes of high mountain ranges, and their protection is essential to the maintenance of streams and springs; over half-a-million acres are situated in the extreme Eastern part of the State, but, owing to difficulties of transport, are not at present accessible for practical working; half-a-million acres, chiefly in the central district, which have been cut over, are closed for the protection of the young timber: while in the remaining area, over 500,000 acres, timber cutting is carried on in various parts. The bulk of the forest revenue is, however, derived from a total area of about 250,000 acres, the trees being felled chiefly under the selection system of treatment; while for the supply of mine-props and fuel large blocks are allotted and worked as coppice, or coppice with standards, thinnings only, light or severe as the circumstances require, being made where necessary.

TREE DISTRIBUTION.

In the early days of settlement little care was exercised to delimit and protect for the use of the community the best forest areas on the plains and lowlands. In some instances, indeed, good agricultural land bore excellent hardwood, such as redgum, and with some reason the claims of the State yielded to the pressure of settlers, whether the land was required for tillage or pasture. But in the case of the poorer lands, such as the auriferous



Giant Mountain Ash Trees. (*Eucalyptus amygdalina regnans.*)

belts of Silurian formation, bearing ironbark and grey box, which stretch from the River Goulburn westward to the Northern Pyrenees, there was seldom any valid reason for alienating inferior soil, fit only for the grazing of sheep. It bore naturally the best crop the soil was fit to yield, but this was speedily ringbarked and destroyed on thousands of acres in the endeavour to improve the pasture. In the same way, in Gippsland, the areas of forest redgum, a timber of exceptionally fine quality, were quickly alienated, so that, to-day, the State possesses only some 1,300 acres of this hardwood in the whole of the Eastern division.

The early sale, in large tracts, of the fine volcanic lands of the Western District, and their long retention as a vast sheep-walk, have undoubtedly had an evil effect on the proper settlement of Victoria. Not the least mischievous result has been that, as the population increased, land selectors had to endeavour to make homes for themselves in the thick virgin forests of the Otway Peninsula and Western Gippsland, thus destroying by axe and fire in a few years enormous areas covered with valuable hardwood, as well as woods of fine grain. Despite, however, the reckless destruction of bluegum, mountain ash, messmate, blackwood, and beech, on the mesozoic sandstone ranges of the Southern District, and of ironbark and box on the central tablelands, Victoria is still the best wooded of all the Australian States. This, however, is obviously due to the extent of her mountain territory and average rainfall, and not to any protective action on the part of her people. The best forests of commercial value are now chiefly confined to the uplands and mountain slopes of the Eastern and North-Eastern Districts, but along the course of the Murray there are still valuable areas covered with redgum in all stages of growth; while in the Central District there are extensive tracts bearing healthy young messmate, box, and ironbark. One remarkable feature of settlement and of the restriction of the destructive forest fires, which used to burn for weeks without check, is the gradual encroachment of thick belts of young timber on the lower slopes and foothills of the mountain ranges. This is especially noticeable between Mount Wellington and the Snowy River in Gippsland, in the Otway District, and between the North-Eastern railway and the head of the Ovens River. Where open forests of large trees once stood, a close, and in many cases almost impenetrable, growth of spar timber and saplings has taken their place. Again, where, within the memory of men still living, the country consisted of thinly timbered or bare grassy slopes, the surface is now completely covered with stringybark, box, and whitegum, and on the higher levels mountain ash. This extension of young forest is, of course, confined to districts with a regular rainfall, and, from a forester's point of view, it is not an unmixed benefit, since inferior trees of the stringybark family in many instances dominate and crowd out more valuable species.

The natural reafforestation of trees of slow growth such as grey and yellow box, and to a less extent of redgum, is greatly impeded by the maintenance of dual authority in connexion with forest grazing. The control of grazing in many valuable unreserved forests is still retained by the Lands Department, and exercised in a manner which often greatly injures them. Sheep especially greedily eat seedlings and stool shoots of many species, even when grass is abundant. They thus destroy all hope of obtaining regular hardy crops of

natural growth. To this cause alone is due the absence of young pole timber in many valuable forests, where rabbits are scarcely ever seen. Every endeavour has been made, but generally without avail, to put a stop to this senseless practice of sacrificing young forest growth to what is at best a small grazing revenue, and, until the Conservator is given statutory power to regulate all grazing in forests, there is no likelihood of proper control in this respect being exercised.

Whilst in some of the settled districts there is a scarcity of mature timber of commercial value, the supplies of useful hardwood, such as bluegum, spotted gum, blackbutt, mountain ash, messmate, stringybark, and peppermint, which, owing to the extensions of railways, are now accessible, are probably greater than at any time since the beginning of settlement in the State. It is true that many areas of redgum, ironbark, and grey box are closed for a period of rest, the mature trees having been cut out; but on the other hand timber of the three kinds mentioned is used to a less extent than formerly, and is chiefly in demand for railway, harbor, and municipal works, where strength and durability are essential. Although the percentage of waste in conversion, owing to hollows or inferior heart, is considerable, large stocks of redgum of fine quality are still obtainable in the Murray and other river reserves, while some 60,000 acres of healthy young forest of this species, with a stem diameter of 6 to 20 inches, are strictly protected. It is significant that, owing to the supplies of redgum, box, and ironbark sleepers which are still obtainable, railway engineers in Victoria are able to obtain sleepers of these exceedingly durable hardwoods at prices lower than the rates which rule in the neighbouring States of New South Wales and South Australia. It is to be regretted that bluegum is not now used in re-sleeping lines. Records which cannot be questioned show that in the early days of railway building here it was so employed, and proved to be durable. In Tasmania, with a wetter climate than Victoria, its average life in the track is about sixteen years. On a section of the Geelong to Ballarat line, bluegum sleepers cut at Apollo Bay, near Bass Strait, are reported to have lasted nearly 40 years. It is estimated that in one district alone nearly 2,000,000 sleepers could be hewn from faulty trees of this species which the mills have passed by, and which are now going to waste. With regard to the supplies of hardwood in our mountain forests, such as the Upper Yarra and Otway reserves, when it is borne in mind that a sound mill tree of fair size will yield from 700 to 1,500 feet of sawn timber, and that many trees will give up to 3,000 feet, while the yield per acre in a good virgin forest varies from 30,000 to 50,000 feet to the acre, according to the species, it will be realized that a mill of ordinary size, cutting, say, from a million to a million and a half feet annually, makes very little impression on the standing crop at the end of a year's output. Taking, as a standard for yield per acre, trees such as mountain ash or blackbutt, which give a fairly mature crop in a rotation of 60 to 90 years, there are belts on the Yarra watershed, in a reserve of 300,000 acres, which, under selection cutting, leaving many young immature trees standing, yield over 25,000 feet per acre, or an output of 2,500,000 feet from less than 100 acres. The yearly output of sawn timber from Victorian forests is, roughly, 60,000,000 super. feet, and of this quantity the Yarra and Otway reserves yield nearly 30,000,000 feet.

VICTORIAN TIMBERS.

With respect to hardwoods which have a high commercial value, Victoria has some twenty, all species of the eucalyptus family. In addition, there are about 40 woods of fine grain, many of them, however, being trees of small size, and confined to limited areas in the deepest recesses of the hardwood forests. At the head of the latter, for size, beauty of grain, fitness for cabinet work, and general utility, stand the blackwood and evergreen beech. Both of these are now chiefly confined to creek valleys in Otway peninsula, Gippsland, and Wilson's Promontory. The hardwoods of Victoria are of a class well known in Australia and Tasmania, and have been in general use for all kinds of building construction, as well as for railway lines, telegraphs, and harbor and bridge work, since the first settlement of the country. They may be divided into two main classes—in the first rank, for hardness, durability, toughness, and general utility, are redgum, red ironbark, white ironbark, grey box, bluegum, spotted gum, N.S.W. blackbutt or flintwood, yellow stringybark, and Gippsland mahogany; while in the second class may be placed messmate, white mountain ash, red ash, the three stringybarks, and bloodwood. In addition to these hardwoods, and woods of fine grain, there are, among many inferior species, five acacias, which yield tanning bark of good quality, the most valuable being the golden or broad-leaf, and the black feather-leaf varieties.

TREATMENT OF INDIGENOUS HARDWOODS IN VICTORIA.

If we examine closely a virgin eucalyptus forest, untouched by fire or the hand of man, which bears timber fit for building or general construction, we realize with what care nature has done her work and brought the trees to the point of maturity. Wherever the soil is deep and strong, giant trees, some 40 or 50 to the acre, rise in a certain defined order and overtop the forest. On the edge of these, clinging to westerly slopes, where they get the afternoon sun only, are trees shorter but more cylindrical in bole. Among them, in open patches, where a late survivor of the older forest once stood, are found low broad-crowned seed trees with clumps of seedling pole-trees just outside the ring of their shade. Higher up, on terraces or ledges where rock alternates with soil, are found the strongest and toughest trees of the forest. These, being of slow growth, are commonly stocky and short-boled, but their roots strike deep into the crevices of the rocks, and the grain of the timber they yield is like the grain of forged steel, being as closely interlocked when viewed under the glass.

In such a forest natural conditions have combined to bring about large growth, but always there remain at intervals a few spindly suppressed trees. Either the more vigorous trees have robbed them of soil and light, or the parent tree from which they germinated has been deficient in vigour. Wherever these weak trees stand, the bole, if straight at first, turns with a curve or sharp angle and shoots out towards the light. In severe fires these are usually the first trees to fall or receive fatal injury. Deficient in sap-flow, the flames quickly make a breach, and wood-borers or ants complete the work.

It is a common fallacy that no forests are so easily reproduced as eucalyptus forests, and that nature will quickly replace what man has ruined. I would correct this, and say that no forest is so easily ruined or got out of



"KING EDWARD."—GIANT TREE AT MARYSVILLE. 80 feet girth, 200 feet high.

order as a eucalyptus forest, and that in the very profusion of its natural reproduction lies the danger, unless all cutting and removal of timber is strictly controlled on a fixed plan. Take the virgin forest I have just described. If we open it to saw-mills, giving the owners a free hand, and binding them only to cut out all timber above a certain size fit for their industry, what is the result? The mill is set down near a stream, and the plant, being fairly effective, with, say, 25 or 30 horse-power, should cut 8,000 to 10,000 feet superficial daily. The miller wants for his main output, not the best timber or the largest trees, but the greatest quantity of timber of average quality fit for sale, which is easily got and close to the mill. Therefore the first breach is made around the mill. The trees are felled criss-cross, so that in a few months rough logging tracks have to be cut through the tangle of heads, waste trunks, and *débris*. Often the very trees which should first come out in the first felling block, the over-ripe stems which will yield 50 per cent. to 60 per cent. of timber, are left. Soon these are so surrounded by heavy *débris* that the loggers and teams cannot approach them; they are therefore left as food for the first heavy fire which is lit by the miller or grazier. As the miller began his work, so he pursues it, and so he finishes it, leaving in the confusion and tangle hundreds of valuable trees which, when the logs have to be hauled further, he would be glad to take but for the cost of clearing new tracks to properly reach them. It is too much to expect a timber-getter to pay regard to the future productiveness of a forest, or even to the best means of cutting and converting the timber in order to get the highest weekly yield. But more than this, I have never yet known a miller, if given a free hand, to set his mill and lay out his tramways and logging tracks so as to get a continuous supply without blocking his lines or tracks with *débris*, thus securing at a low cost a daily supply of logs to keep his working plant at full speed. As he cannot, or will not, do this, the forest staff have to do it; and this is the first reform we have gradually taken in hand. The mill site is chosen, and the tramway routes laid out by the forest staff. Wherever the contour admits of it, the first cutting block allotted must be opened for work at the furthest point from the mill. Whether the acreage is large or small is a matter of detail. The trees are felled up the slope or along the slope—never down the slope. Wherever it can be done, the heads lie on a rough line for future burning. Before the dry season begins the inflammable leaf masses are burnt by the mill employés. As much of the tops as will burn is consumed at the same time. What remains is the trunk-head and the large limbs, which, where practicable, are burnt by the forest staff within a year. The whole course of the work is towards the mill, and not from the mill. As one block is cut over and the tops burnt, the next block is opened for cutting; but the miller cannot again enter the first block and take any solitary trees he may have left there. If the forester has done his duty, no such trees are left; and the forester resumes possession, and makes the final clearing for the next crop by natural reproduction from the few seed trees reserved and the dormant seed in the soil. Some will say this is too intensive for Australia, but it is not nearly so intensive as the work in high forest which lies before us if we do not wish to lose in our virgin mixed forests some of our best species. As to the system to be pursued in cutting, wherever the standing crop is of fairly even age and size, I advocate and enforce

a clear felling in sections, leaving, in addition to seed trees, only trees fit for piles and girders. And even the latter should be removed before the end of the second year. But when you are dealing with a forest of all ages, you cannot, of course, sacrifice half-mature timber to a fixed plan; and in such a case you must remove the over-ripe and mature trees by careful selection, controlling the felling, logging, and conversion in the same way as in clear felling. But the latter, once established, is comparatively simple, whereas proper selection felling is full of difficulties in its effect on the semi-mature timber and spar or pole timber which remain. It is generally better in selection-cutting to leave standing over-ripe trees, which, however carefully felled, would damage or destroy much healthy pole or spar growth. When at last the top of the old tree falls piecemeal in wind storms, the surrounding belts of young timber are stronger and better able to resist the impact. It is the enormous mass of trunk and head falling with one crash that ruins the young forest. If the forester carefully controls selection-cutting, noting trees whose fall will destroy valuable young timber in bulk, and marking every mature, defective, or diseased tree which can safely be taken out, he can make great improvement in the cutting block as he found it. The result will, of course, be an irregular forest, the work in which will always need watching; but his aim is to gradually reduce this unevenness and roughness of growth till on irregular areas he approaches to even-aged forest. These remarks apply generally to mountain and hill forest; but, even with such a timber as redgum on alluvial plains and river flats, clear fellings are resulting in valuable new crops of even-aged growth.

As to other systems pursued in dealing with mature forests in Europe, these are largely due to the fact that mixed planting is followed with both deciduous trees and conifers. Underplanting for soil formation and shelter with hardwoods, and the planting of nurses for conifers, must always complicate the lines of cutting and removal.

The simplest and best forms of management for adaptation, but not adoption, in Australia, are, I think—first, clear-felling; second, modified selection; third, for young forest, coppice with standards, or a modification of the shelter wood compartment system; fourth, simple coppice, or the clear-felling of pole timber.

Coppice with Standards.—It will be noted that I say coppice *with* standards, and not coppice *under* standards, because our eucalypts are nearly all light demanding, and few flourish in excessive shade. Let us take the case of a young ironbark and box forest, the age of the trees ranging from 15 to 30 years, with an average diameter of 6 or 8 to about 12 inches. Many of the smaller stems are either suppressed by having grown under the shade of more vigorous trees, or have not the plant food and moisture essential to regular growth. The soil of the forest is a sandy loam, with clay subsoil in the flats and valleys, with hills and slopes of ironstone, intermingled with shales and slates. The forest is fairly open, the trees standing in clumps and groves at short intervals, dense growth being found only where fire has left a deposit of charcoal and ash. In treating this forest for the production of piles, pole timber, and fuel, while keeping in view the retention of every tree fit to yield mature timber, the forester must abandon the idea of thinnings in the

true sense. The area bears, say, 80 to 150 trees to the acre; but many of these are stunted or misshapen in growth. Where a tree has not been attended to in time, the fatal double-leader or outstanding low branch has shot out and destroyed the clean bole essential for annual increment of timber. The crooked tree and the one with a double leader must go. Also the suppressed tree and the stem affected with insect disease or dry rot. Also the tree that on a dry ridge is barkbound and becoming stagheaded. When we mark for removal all faulty or diseased trees, it is surprising how few are fit to remain to the acre. For permanent standards in hundreds of cases we have fixed the number at 25 to 40 trees. Now, in pine plantations, to secure even development and clean boles, we plant the young trees about 8 feet square, or 680 to the acre. Until about the sixteenth to the twentieth year such trees are not overcrowded. On the other hand, all eucalypts, being evergreen, take more from the soil than either deciduous trees or conifers, and restore but little by their shed leaves, save where heat and moisture are combined. So that while close planting and close natural growth are essential with most eucalypts up to a point where they attain a fair standard length of bole, trees such as the ironbark and box, which flourish best in open order, should not at any stage be overcrowded. Even in the best high forests of the Australian Alps, where the young amygdalina forests in the pole stage are thick as a crop of corn, when nature has finished her work, and snow and wind storms have levelled the weaker and suppressed trees, we rarely find more than 45 to 50 trees to the acre. But these are veritable giants, and if subjected to a clear-felling and proper conversion would yield from 150,000 to 200,000 feet of timber to the acre. If then the ash forest, with its bountiful rainfall and deep soil, topped by the leaf mould of many generations of trees, produces about two score ripe trees to the acre, the ironbark and box forests, growing on the poor soils I have described, with no humus or other fertilizing matter, are obviously not fitted to carry more, but rather less.

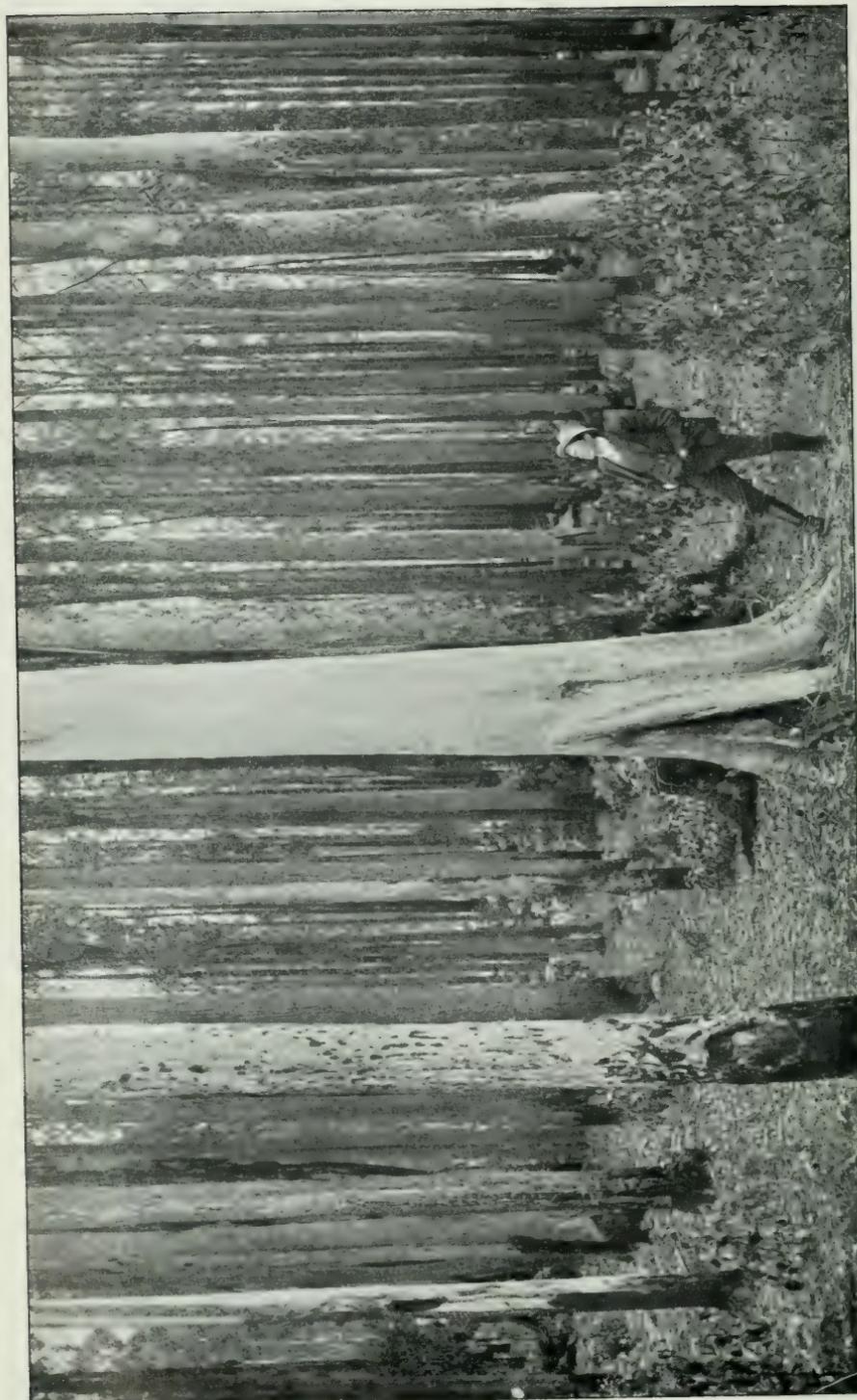
Hence the need of deciding early (1) the number of standards to be left to mature; (2) the number of seed trees, some of which may not be fit for standards; (3) the number of trees to be felled to insure a healthy stool growth; and (4) the number of trees which have germinated under shade, and are too close to standards to grow into timber. The ease with which most eucalypts sprout from the stool is not an unmixed blessing. Except with the mattock or the aid of arsenate of soda, the superfluous roots and stools are difficult to destroy, and poison has to be employed with care lest any of the roots of a neighbouring standard be affected. Yet, if left, the growth of both the standard and neighbouring healthy stools are affected, and therefore they must be killed.

Stool-cutting for the production of coppice should, as a rule, be confined to autumn and spring, although it may safely be carried on in winter if the season be mild and without severe frosts. The summer heats open out the bark, and often destroy the stool. A good stool-cutter must be able to cut both right and left handed, must cut the stool not more than 4 inches above the surface, and with an even slope in one direction, without a hollow in the centre. In this way

the rainfall drains off rapidly, and does not lie on it or sink into it. Thus early dry rot is avoided. Under ordinary circumstances the new shoots appear in from three to eight weeks, and in a year they may be from 3 to 6 feet high. When the best new leaders are clearly developed, and are from 12 to 15 feet high, which should be in the third year, the healthiest stems, two or three in number, are retained and lightly pruned for the new crop, and the rest are removed. This removal can be done in a mild autumn, but it is best done on the approach of spring.

The question naturally arises here, (1) in what rotation or at what intervals can the new crop of coppice timber be looked for, and (2) how many coppice crops in succession may be obtained from a healthy eucalyptus pole forest? Any generalization on these questions would be dangerously misleading; so much depends on the normal rate of growth of the species chosen for treatment, and on the soil and climate of the place where the forest grows. I prefer to keep to what experience shows. In this State, in the vicinity of large gold-mining centres, where the demand for props and engine fuel is very heavy and must be met, we fix a rotation of 18 to 25 years—the shorter for small poles, say, 5 to 8 inches, and the longer for poles 8 to 12 inches in diameter. In such centres, from about the year 1851 to 1864 the mature forest was removed. This was succeeded by thick crops of seedlings. When the second crop reached 6 to 9 inches in diameter, it was cut over badly and irregularly, many high stumps being left. From about 1880 to 1890 fairly low and clean cutting was carried out to get the full length of mine props and the largest quantity of fuel obtainable. This again was followed by low stool-cutting on a regular basis; but too many rough standards were left to the acre, and too many of these were partially under shade and suppressed. Now the system has developed into coppice with standards, the forest being divided into blocks and compartments on an 18 to 25 years' rotation. The compartments are from 10 to 20 acres in extent, but generally 20 acres. They are granted by lot, so that each regular cutter has a chance of getting a good block or an inferior one. Where there is a large stand of inferior timber the acreage is increased. Every tree to be felled is first marked by the forester, except in the case of badly burnt or diseased areas, where he marks the trees to be reserved. As one result of strict control, we find that the forest gives a better sustained yield, the vigour of the stool growth has much improved, the average yield per acre is more even, and the forest floor is cleaner, and therefore less subject to insect disease and the ravages of fire. The cutters who grumbled at first now value the regular means of livelihood, as on the 1st of April every year the forest is opened for felling, while it is regularly closed on the 30th of September. By that time the mines must have their summer supplies purchased and stacked; and if they need additional fuel, it must be got from dry material in more distant forests.

The yields under this system vary considerably, but 7 to 9 tons of fuel (of 50 cubic feet each) and 500 to 700 lineal feet of mixed props would be a fair average. The royalty value to the State is from 6s. 6d. to about 12s. an acre, and, of course, all the best trees—*i.e.*, the standards—remain untouched. The value of the latter at the time of treatment, considered as poles, would be from £3 to £4 10s. an acre.



STAND OF POLE TIMBER.

To sum up, under Victorian conditions, in a box and ironbark pole forest a rotation of 18 to 25 years is safe for the growth of pole timber 6 to 9 inches in diameter, with a proportion of 12-in. timber. As regards continuity, in the light of our short experience, from four to six crops of fairly vigorous growth may be expected from coppice with standards. After that, unless the soil is deep and rich in plant food, when crops may perhaps be multiplied indefinitely so long as the root system is unimpaired, the crop and yield, I consider, will gradually dwindle, and the forest must then be replaced with seedling crops, either of the original or new species.



STATE NURSERY—CRESWICK PLANTATIONS.

PLANTATIONS AND NURSERIES.

In plantation work, and gifts of trees for shelter belts to small settlers, a great advance has been made during the past few years. The largest State plantations are established near Geelong, Maryborough, and Creswick, at Frankston on Port Phillip Bay, at French Island, and at Dimboola on the north-western plains, the total area being nearly 10,000 acres, and the experience thus gained in the propagation and growing of Australian hardwoods, as well as exotic conifers, has been of great benefit to the community. In addition to the young trees reserved for the plantations, from fifty to seventy thousand transplants are distributed every year, the bulk of the stock being issued to farmers in the Northern district, State schools, and municipal councils. For plantation work, Victoria may be divided roughly into three main districts, the Northern, Midland, and Southern. In the Southern district, evergreen oaks, elms, planes, Himalayan and Californian cypresses, deodars, Mt. Atlas cedars, and robinias; hardy pines, such as *Pinus insignis Canariensis*, *Pinaster*, *Laricio*, and *Austriaca*; and eucalypts, such as sugar

gum, Gippsland mahogany, yate, and swamp mahogany, flourish. The same trees thrive fairly well in the sheltered areas of the central lowlands, while on the higher levels, silver and spruce firs, the Douglas fir, Californian redwood, and the mammoth sequoia show fair growth. It is, however, one thing to grow trees in a shrubbery or park, and quite another to plant them in close lines for the production of timber. Unquestionably, no eucalypt so far has given the State such uniformly good results for the latter purpose as the sugar gum, the timber of which, in its original home (South Australia), is in high repute for railway and harbor works and telegraphs. Among conifers, the handsome *pinus insignis* easily distances all rivals in height and stem growth. Of late years it has been propagated for timber as well as for shelter belts. Its timber, although it affords useful material for interior construction and case-making, cannot, however, compare with the better class of merchantable pines, or with the redwood of its native State. Its great utility here is as a shelter tree. It exhausts the soil in its neighbourhood, and should not be planted in or near a garden or orchard; but on the windward side of homesteads, outbuildings, or farmyards, it is a great protection. The Lambert and Lawson cypresses of California have also come into favour for shelter-belts and hedges in Gippsland and the Southern district generally. The former thrives even in the drier climate of the Northern plains, its range extending eastward from St. Arnaud to the Goulburn River. In the Northern district, owing to the irregular rainfall and the desiccating winds of the summer season, the choice of trees for shelter and shade is very limited. At the head of the list stand the sugar gum and pepper tree, for loamy and clay soils, while the robinia or false-acacia, the currajong, box-elder, silky oak (*grevillea robusta*) and the white cedar or Pride-of-India come next. In saline soils in this region, the Aleppo pine, tamarisk, ailanthus, false-acacia, and Moreton Bay fig have given the best results. Even to the extreme Northern limit of the State no hardwood transplant equals the sugar gum, its one drawback being that, especially when planted out towards the end of winter, it is very sensitive to frost. It has now been propagated and grown here for some 25 years, and, as it has attained in the plantations in that period a girth of 45 to 60 inches, its hardy habit, quick growth, and comparative freedom from insect or fungoid disease, have amply justified its selection as a standard eucalypt. At one time the bluegum was extensively planted, too often without any regard to the climate and soil which suit it. On the plains of the central and coast districts it has not been a success. It is peculiarly liable to the attacks of wood-boiling beetles, and so far, better timber being still available, there is no demand for it in the pole and spar stage for mine props; while, so long as box, ironbark, and redgum are available, the general public will not use it for fuel. Undoubtedly the bluegum is one of the finest of Australian hardwoods, but, as a whole, the plantation-grown trees of this species on the plains do not equal in the quality of their timber the natural mountain growth of the forest reserves. When worked as coppice for the production of pole timber and fuel, bluegum in the plantations will yield, in a short rotation of 20 to 25 years, from 7 to 10 tons of dry fuel per acre per annum. The State has still fairly large areas of this timber, in the Otway Peninsula, the North-Eastern reserves, Gippsland, and Mt. Cole. The belts of limestone

country which form the sea-front to the Southern Ocean have a climate of their own, and here, owing to the prevalence of strong south-westerly winds, only the hardiest trees suited to calcareous soils flourish. Among conifers may be mentioned the handsome Norfolk Island pine, the Lambert cypress, and the Aleppo, Austrian, and Cluster pines. Among Australian trees, the erect and drooping varieties of sheoak rank first, as they not only furnish shelter and shade, but also yield excellent fuel. Next to these, come the *Lagunaria* of Queensland, the local Boobyalla, and the coastal wattle (*acacia longifolia, var. sophorae*). The latter, in conjunction with marram grass, is also a most valuable sandstay on the dunes.

The plantations established during the past twenty years were for a considerable period merely experimental. The choice of the Monterey pine (*p. insignis*) as the standard conifer for the production of softwood, while trees, such as the Douglas fir (*Oregon pine*), the pitch pines of America, the Californian redwood, and the Corsican pine were neglected, was unwise, for the reason, among others, that it has caused the loss of so long a period of growth of the more valuable species. The further mistake of planting conifers 12 feet and upwards apart, which resulted in broad-crowned trees with strong lateral branches, thus greatly weakening the timber by excess of knots, and retarding the free development of stem-growth, has been avoided in later work, close planting being now the rule. Even in the growth of such useful trees as the white willow, Carolina and Canadian poplars, cottonwood, basswood, and tulip tree, which will flourish in many parts of Victoria, and furnish light, tough timbers useful for furniture, parts of vehicles, and box-making, nearly a generation of time has been lost. Happily, during the past few years steps have been taken to test the growth of many trees such as these. Many of our hardiest eucalypts are now sown broadcast, instead of being raised in nursery lines and put in their permanent sites as transplants; but this method, of course, involves the thorough working of the soil to a fine tilth. Where transplants of such trees as sugar gum are used, good results have sometimes been obtained by laying down properly prepared nursery beds at the plantations, and raising the young trees on the spot.

Planting or sowing is costly, and, in the case of indigenous trees, is only advisable at present on open or denuded lands, where there is no tree growth. To remove useful forest growth, native to the soil, and plant inferior exotics in its place is simply folly, and a very expensive folly in the long run. The first cost of laying down a plantation ranges from £3 to £4 an acre, and the maintenance expenses are afterwards heavy. The area chosen must not only be substantially fenced, but also wire-netted, to prevent the ravages of rabbits and hares, and this netting is a serious item when a large tract has to be enclosed. It is sound policy to encourage plantations of conifers which yield timber of good quality, but, as regards our own eucalypts, the hardiest and most vigorous trees are those which spring up from seed in the natural forest. Artificial re-stocking in these forests is seldom necessary, as by light thinnings and cleanings, valuable young crops can be greatly improved at less than a quarter of the cost of raising them in plantations, while on denuded areas healthy

germination can nearly always be obtained from dormant seed after the surface has been cleaned of bracken and débris and fired at the proper season.

As regards the raising of tree plants, three large nurseries are maintained at Macedon, Broadford, and Creswick, the latter being reserved for coniferous species, and the other two for deciduous and evergreen trees. The total output at present is about four million plants annually, but this number is to be largely increased.



MONTEREY PINE (*P. insignis*)—CRESWICK PLANTATIONS.

A brief account of the methods of planting and of the choice of coniferous trees is given below:—

CONIFEROUS PLANTATIONS IN SOUTH-EASTERN AUSTRALIA.

There are two errors widely prevalent in Australia in regard to the growth of forest trees, viz., that most of the timber-yielding conifers which have been introduced here require strong, if not rich, soil, and that conifers when set and flourishing in plantations are always more sensitive to the ravages of fire than any of our eucalypts. These errors have greatly checked planting on private estates in Victoria, and the time seems to be opportune, therefore, to put the true position clearly before the public.

Conifers are much less exacting in the matter of soil and habitat than broad-leaved trees, whether the latter be evergreen or deciduous. If we examine a wide belt of country from the shore-line to the Dividing Range, and stretching from Spencer Gulf through Victoria to Port Jackson, we shall find that many of the hardier pines of the northern hemisphere flourish exceedingly well, and that in the more favoured spots which unite deep soil, a cool climate, and a fair rainfall, they attain a length and diameter of bole

fit for the production of timber in from half to three-fourths of the time they require in the colder climate of Great Britain. This is doubtless due to the fact that, owing to our mild winters the period of rest from growth in most districts is very short ; and it is remarked, if we have a bright, clear winter, without snow or hail on the uplands, that almost continuous growth in the younger plants is perceptible. There is no sudden and violent check from frost and cold striking deep into the soil, and the result is seen in the width of the annual ring of spring and autumn wood with which the tree steadily enlarges its stem.

Let us consider for a moment the second error : the undue inflammability of conifers. It must be admitted that there are some thin-barked conifers, such as the white pine (*P. Strobus*) and the Douglas fir (*Pseudotsuga Douglasii*), which are easily damaged even by a light fire at first, just as in dry situations their young bark is liable to sun-blister ; but, on the other hand, many of our useful eucalypts, such as the blackbutt, the mountain ash, and the messmate, are, in the pole or spar stage, also easily damaged by fire. And knowing their value, we do not cease to protect or improve them in the forest, or, when necessary, to propagate them for plantations. But if, in dangerous situations, we give preference to rough-barked conifers, such as *Pinus insignis*, *Pinus Jeffreji*, *Pinus laricio*, *Pinus Canariensis*, or the Californian redwood (*Sequoia sempervirens*), mark out and clear proper fire-breaks and cross-lines, keep the plantations floor clean, prune lightly where any lateral branches which require removal exist, and burn in early spring all débris, there is no real risk of fire. Indeed, on several areas in Victoria we, early in spring, often run a light creeping fire on hill slopes and crests so as to remove harbor for insect pests and cover for rabbits and hares, the latter being then more easily disposed of. In such cases, where a fire would at once run up a fibrous-barked eucalypt, it never even scorches a rough-barked pine. The light mulching of the fallen needles is quickly renewed, and of course in valleys and bottoms, where the carpet of needles is very thick, and all but the top layer remains damp throughout the summer, this soil cover is carefully preserved.

Monterey Pine.

Taking the trees not in the order of the quality of their timber—for if we did we must begin with the pitch pine of the southern States, the Douglas fir, the Californian redwood, and the Scots pine—the first which calls for notice, owing to its power of adapting itself to nearly every kind of soil, and its unusually large annual increment of useful timber, is the Monterey pine of California—*Pinus insignis*, as it was classed for a long period, but *Pinus radiata* as it is now classed by Sargent, of Harvard, the great American authority, in both his Silva and Manual. In passing, I may remark that its transfer to Australia affords the only example with which I am acquainted where a tree planted as an exotic, and under the influence of a more equable climate and stronger soil, produces a better and stronger timber than in its natural home. At Monterey, its timber is considered to be much inferior to sugar pine. Growing at Monterey on sandy slopes, exposed to violent gales and subject to extremes of heat and dry weather, it produces, we are told by early settlers, as well as by botanists, a rough, coarse, brittle, and weak timber.

Sargent, in his *Silva of North America*, confirms this view. With us, it will flourish from the sandy clays of the coastal belts, through alluvial flats and slopes, on the shales and slates of the foothills, and on volcanic hill cappings up to the granite of the central ranges at a height of over 3,000 feet. Our first planters set it out 12 to 14 feet square, the result being excessive lateral growth, inferior and often crooked boles, and a coarse-grained, knotty timber. Since then we have planted it 6, 8, 9, and 10 feet square, but have now, in most soils, made 8 feet our standard distance. If we were to fix the British or German distance for conifers (3 to 4 feet), we should have a much slower growth, and a higher working cost to contend with, as there is no sale here for hop-poles or small pit props, as in Europe. The 8-ft. interval promotes quick growth, draws up a clean-boled, well-balanced tree, and from about the tenth to the twentieth year onward produces as thinnings, cut under the selection method, boles about 5 to 8 inches in diameter. It is then fit for narrow flooring-boards, wall linings, dray or cart bodies, wheelbarrows, and case-making. In Victoria, its timber is worth about 11s. to 12s. per 100 feet superficial, when the trees are well grown and not weakened by many knots. There is on Mount Macedon a stand of Monterey pine of about 60 acres, the trees being from 22 inches to 2 ft. 3 in. in diameter, and the boles from 45 to 60 feet in height. The plot is from 30 to 32 years old, and a careful estimate fixes the yield of timber in the square at about 1,900,000 feet, or, taking the ruling price, the value of it converted would be at least £180 an acre. We have had several estimates prepared, based on the actual prices realized from thinnings, and the average annual increment of this tree in the soil and climate of the plantation concerned. The probable yield of timber works out at from £150 to about £200 per acre on a fairly conservative basis. It is quite possible that these figures may have to be modified in the light of further experience; but, as the price of all coniferous timber is rising, I feel sure that Monterey pine, once it can be regularly put on the market, will be in great demand, and that timber merchants, and even joiners, will put a higher value on it as its merits become known. A final word of caution as to its planting may here be given. It is not a long-lived tree, and between its thirtieth and fortieth year, when fairly mature or approaching maturity, it is sensitive to drought or even a short period of great heat. This applies especially to stiff basaltic or shallow clayey soils overlying hard sheets of rock. Where, however, the roots can strike deep and penetrate into beds of gravel or boulder clay, it flourishes remarkably well even in dry districts. But it loves cool, sheltered valleys where the hills approach the coast, where it has in winter protection from harsh gales, and in summer the coastal showers and general humidity which prevail where land and ocean currents of air meet.

Corsican Pine.

Second on the list for evenness of growth (but first for quality of timber) we place the Corsican pine (*Pinus laricio*). The type-form of Corsica, with the varieties Pallasiana and Taurica, from the Black Sea region, have been planted out. The two latter varieties promise well, but are yet too young to enable us to judge of their probable production of timber. The true

Corsican variety, however, is healthy, hardy, and vigorous, and in some instances, after about the twelfth year, overtakes even the Monterey pine. Logs of laricio, of fourteen to twenty years' growth, have been sold and cut up from time to time, the boles being from 6 to 9 inches in diameter. The timber is dense, even in growth, interlocked, strong, and finer in grain than Monterey pine. It also loves well-drained hill slopes, with an easterly aspect, and flourishes best on cool uplands near the Dividing Range. Although the rotation will be somewhat longer and the yield per acre less than that of Monterey pine, its finer qualities will to some extent compensate for these drawbacks.

Douglas Fir.

This tree is at all times, but especially in the pole and spar stages, very sensitive to wind, the leading shoot being somewhat brittle—and many a fine shrubby tree, both in Britain and here, has been disfigured by lack of care in recognising this fact. Producing as it does one of the finest softwoods of the world (known and sold here as Oregon pine), it should never be planted in exposed positions, but confined to deep sheltered valleys and folds in hill country. It is easily propagated, but rabbits and hares are very fond of nipping the leading shoot. A rabbit will frequently pass by insignis, and nip every laricio and Douglas fir it meets with. Hence wire-netted fences and rabbit destruction must always be provided for. Being a smooth-barked tree, it must also be carefully protected from fire. It does well in our mountain ranges at fair elevations—up to about 3,000 feet—but it promises the best growth among the hills of the sea coast.

Pinaster.

We now come to the Pinaster, or cluster pine (*Pinus pinaster*). This tree, as is well known, produces one of the useful turpentines of commerce, and grows along the Bay of Biscay and the shores of the Mediterranean. Here it is one of the least exacting of pines, growing on the sandy strips of the shore-line, on poor granite drift, and on shales and slates some 50 miles from the coast. It, however, does best on the coast; but it is always a somewhat stocky, ungainly tree, with open covert and a somewhat wide-branched crown. The tree often has a list, from the prevailing winds. The timber is cross-grained and somewhat brittle. Our best hope with this tree in south-east Australia, I think, is to grow it for the production of turpentine and inferior timber only.

Redwood.

Next follows the Californian redwood (*Sequoia sempervirens*), one of the best of all conifers, whether we consider its handsome foliage and beauty of outline or the fine quality of the very durable timber it produces. At Macedon we have a small plot of specimen redwoods 34 years old. The best trees are 6 ft. 9 in. in girth and 66 feet in height, the soil being a poor schistose clay. This tree also must be grown at a fair elevation, with shelter from wind, and in fairly deep strong soil. It has one great merit for Australia, as its rough bark renders it fire-resistant. From a timber point of view, its only

defect lies in quantity of yield. Its bole is not cylindrical, and its sharp taper, like that of the Thuyas, must always affect its market value on a quantity basis. Yet, wherever it will succeed, we should plant it largely.

Menzies' Spruce

The Tideland, Menzies, or Sitka spruce (once *Abies Menziesii*, now classed as *Picea sitchensis*) takes high rank owing to the fine quality of its timber. It is strong, clear-grained, white in colour, of a plain figure, and takes a fine finish when dressed. It requires a cool climate, elevation, and humidity, and can be planted pure or in combination with Douglas fir. Our best specimen tree at Macedon is 34 years old and 6 ft. 10 in. in girth, with a height of 72 feet.

*Bull, or Western Yellow Pine (*Pinus ponderosa*).*

This is the tree which stands high in favour with railway engineers in the central and northern States, as it yields a strong, heavy, coarse-grained, durable timber for railway sleepers, trestle work, piles, cross-ties, corbels, &c. It also is largely used in building construction. It grows vigorously in Victoria, its annual increment in some instances being nearly equal to Monterey pine. With fair elevation and moisture it will grow on poor soils, such as sandy loam, sandy clays, deep granite drift, and the softer shales and slates. Owing to its hardness and large yield of timber it is well worth the attention of Australian planters.

There are a number of other timber-yielding conifers which, having had a good trial in various soils, may now be tried, with the prospect of success, in the cooler regions of south-eastern Australia. Each, of course, has its own favoured habitat, soil, and aspect; but nearly all will grow and make timber in a variety of situations if given the essentials of deep soil and moisture. In support of my statement as to the relatively quicker growth of exotic conifers in Australia than in Britain, I attach a table recently prepared by me on the subject. The figures for Britain are taken from the records of the Conifer Conference of 1891, those for Macedon and Creswick, in Victoria, are from actual measurements. It will be seen that in nearly every instance the advantage in height and in girth lies with Australia.

A final word may be added as to our experience of the first cost of laying down coniferous plantations. This must obviously vary with the natural conditions of the several areas to be treated. In Victoria we allow from £3 to £3 15s. per acre as a trustworthy estimate, including cost of enclosure, clearing and preparing the ground, making breaks and fire-lines, and some light drainage when necessary. Good netted-fencing costs from £55 to £60 per mile, clearing from 20s. to 35s. per acre, and planting from 8s. to 15s. per acre, according to the labour obtainable. The cost of raising the harder pines we put down at 6s. to 8s. per 1,000; with cost of transport, handling between the nursery and plantation, this is increased by 2s., making the total cost, say, 8s. to 10s. per 1,000. We plant 680 to the acre, or at a distance of 8 feet square. Wherever the soil is stiff or at all hard, pit-planting is employed. On moorland areas, or soft loamy slopes near the sea coast, notch-planting is adopted, and with efficient labour has proved successful.

GROWTH OF CONIFERS IN GREAT BRITAIN AND VICTORIA.

Common Name.		Botanical Name.	Place.	Height.	Girth.	Age (Years).	Soil.
Corsican Pine ..	..	<i>Pinus laricio</i>	Boconac, E. Hopetoun, S.	79 0	40 5 9	Loam ; s.s. loamy spar. Sandy loam ; s.s. till.*
			Fota, I.	71 0	70 7 3	Light loam ; s.s. marl.	
			Macedon, V.	70 0	"	Poor schistose clay.	
			Creswick, V.	43 0	4 9	"	
			Linton Park, E.	53 0	3 2	"	
			Dromore, E.	62 0	10 0	Stiff loam : s.s. Kentish rag.	
			"	90 0	11 0	Light loam ; s.s. gravel.	
			Powerscourt, I.	79 0	12 0	"	
Monterey Pine ..	..	<i>P. radiata, var insignis</i>	Macedon, V.	82 0	10 0	Loam, peat ; s.s. gravel, sand.
			Creswick, V.	108 0	10 6	Poor schistose clay.	
			"	110 0	12 0	Alluvial clay.	
			"	115 0	10 7	"	
			"	80 0	5 0	"	
Jeffrey's Pine ..	..	<i>P. Jeffreyi</i>	Fordell, S.	53 0	3 0	Poor schistose clay.
			Revesby, E.	50 0	3 6	Loam ; s.s. open till.*	
			Macedon, V.	48 0	6 8	Loam.	
			Poltalloch, S.	58 0	6 8	Poor schistose clay.	
			"	45 0	9 0	Loam and peat ; s.s. gravel, rock.	
			Revesby, E.	50 0	6 8	"	
			Macedon, V.	51 0	4 6	Loam.	
Bull Pine ..	..	<i>P. Coulteri</i>	Linton Park, E.	44 0	4 6	Stiff loam : s.s. Kentish rag.
			Macedon, V.	63 0	7 3	Poor schistose clay.	
			Linton Park, E.	63 0	9 2	Stiff loam : s.s. Kentish rag.	
			Orton-Longueville, E.	63 0	"	Fertile loam.	
			Whittingham, S.	50 0	4 6	Red loam ; s.s. sandy gravel.	
			Macedon, V.	77 0	9 6	Poor schistose clay.	
			Scone Estates, S.	90 0	7 6	Loam ; s.s. till.*	
			Murthly, S.	50 0	7 8	Loam, peat ; s.s. gravel, clay.	
			Macedon, V.	48 0	4 1	Poor schistose clay.	
Torrey's Pine ..	..	<i>P. Torreyana</i>	"	54 0	5 9	Poor schistose clay.

Contractions : E., England ; I., Ireland ; S., Scotland ; V., Victoria ; s.s., subsoil. * Till, boulder clay.

GROWTH OF CONIFERS IN GREAT BRITAIN AND VICTORIA—continued.

Common Name.	Botanical Name.	Place.	Height.	Girth.	Age (Years).	Soil.
Digger Pine ..	<i>P. Sabiniana</i> , ..	Macedon, V.	..	65 ft.	7 in.	Poor schistose clay.
Douglas Fir ..	<i>Pseudotsuga Douglasii</i> ..	Dromore, E.	..	120 ft.	0 in.	Loam; s.s. gravel.
		Lyndoch, S.	..	91 ft.	9 in.	Loam; s.s. till.*
		"	..	72 ft.	2 in.	Light loam; s.s. gravel.
		Dunkeld, S.	..	94 ft.	12 in.	Poor schistose clay.
		Macedon, V.	..	81 ft.	8 in.	Poor schistose clay.
		"	..	72 ft.	0 in.	Poor schistose clay.
		Hopetoun, S.	..	76 ft.	0 in.	Sandy loam; s.s. till.*
		Linton Park, E.	..	71 ft.	0 in.	Stiff loam; s.s. Kentish rag.
		Macedon, V.	..	50 ft.	0 in.	Poor schistose clay.
		"	..	52 ft.	0 in.	Poor schistose clay.
		Linton Park, E.	..	72 ft.	0 in.	Poor schistose clay.
		Studley Royal, E.	..	72 ft.	0 in.	Loam; s.s. limestone.
		Macedon, V.	..	71 ft.	9 in.	Loam; s.s. stiff clay, gravel.
		Boromoe, E.	..	75 ft.	0 in.	Loam; s.s. loamy sand.
		Fota, I.	..	75 ft.	7 in.	Light loam; s.s. marl.
		Macedon, V.	..	66 ft.	0 in.	Stiff clay; s.s. schist.
		Studley Royal, E.	..	70 ft.	7 in.	Loam; s.s. limestone.
		Rossie Priory, S.	..	70 ft.	0 in.	Loam; s.s. gravel.
		Fota, I.	..	65 ft.	0 in.	Light loam; s.s. marl.
		Macedon, V.	..	63 ft.	6 in.	Stiff clay; s.s. schist.
		Hewell Grange, E.	..	50 ft.	0 in.	Light loam; s.s. rocky.
		Macedon, V.	..	50 ft.	0 in.	Stiff clay; s.s. schist.

Contractions: E., England; S., Scotland; I., Ireland; V., Victoria; s.s., subsoil. * Till, boulder clay.

TREE PLANTS FOR SETTLERS.

In making grants to small settlers, it has been the aim of the State to encourage, by a generous distribution of useful transplants, the growth of trees around homesteads for shelter and shade. The fact that settlers too often wantonly destroy valuable forest in preparing their land for tillage and pasture is to be deplored, but they will only be brought to recognize their error by seeing the benefit derived from planting even a few useful trees to protect their homes, as well as live stock, from stress of weather. The demand for shelter trees is greater than the State nurseries can meet, and issues to farmers are now chiefly confined to quick-growing eucalypts, pepper trees, robinias, and hardy pines. The annual grant of trees has greatly improved the appearance of homesteads on the Northern plains and in other treeless districts, and, so long as it is confined to struggling farmers who could not afford to purchase plants from private nurseries, no reasonable objection can be urged against its extension.

CLIMATIC EFFECT OF TREE DENUDATION.

There is another aspect in regions formerly well-wooded which must not be lost sight of. As settlement creeps up from the plains denudation of tree cover goes on apace. The American wood-lot, the strip or belt of live timber, which is so marked a feature on farms in the North-eastern States, and even in Quebec and Ontario, is scarcely ever seen in Victoria. Here the axe is set to every tree, and often not a shrub is left for shelter or cover. In summer the cattle and sheep vainly seek restful shade. The dam or creek has no screen from the fierce rays of the sun. Evaporation quickly empties the stock supply, which under dense canopy might well outlast any ordinary summer. Around the homesteads may be seen a few sickly pines, keeping the air from the living rooms, and ruining the soil of the small garden enclosures, but the stockyards and outbuildings are left unsheltered. Often on bleak winter evenings dairy cattle may be seen shivering near naked homesteads, vainly trying to escape from the driving rain, while in the paddock hard by native trees, which would have afforded warmth and shelter, stand leafless and dead. What this neglect of shelter means to the dairyman in shrinkage of milk supply is only now being realized. Even in sheep paddocks the same neglect of cover commonly prevails. Some settlers on the plains of the Western District over twenty years ago determined to plant shelter-belts on their lands, choosing, under advice, bluegums, with outside hedges of kangaroo acacia, Osage orange, and boxthorn. The protected hedges gave warm cover, but the bluegums, with their bare poles and open crowns, afforded but little shelter, and were gradually used for fuel, and replaced with sugar gum and Monterey or Aleppo pines. It was soon found that the flocks in the paddocks provided with windbreaks not only kept in better condition than the rest, but that the clip of wool obtained from them materially improved in staple and weight. The experiment was soon followed by neighbouring owners, and to-day the strip of country referred to, between Skipton, Colac, and Yalla-y-poora, although thinly and partially planted, is in marked contrast with the bareness of the neighbouring plains.

But the benefit of shelter belts is not confined to sheep and cattle. Their influence on standing crops must not be undervalued. In the Portland

district there are stretches of limestone land, mixed with sandy loam, which 40 years ago yielded over 50 bushels of wheat to the acre, but which now, even with careful tillage, and the strongest manures, will scarcely yield a poor crop of rye. The live timber between these farms and the coastline has been destroyed, and harsh sea winds laden with salt prevent the healthy growth of cereals. Nor is this a solitary instance of deterioration of climate in a portion of our State having followed denudation. In the Ballarat district there are rich uplands where the peach and apricot flourished and yielded heavy crops about two generations ago. Now, in the same soil, the face of the country being denuded for miles, even the hardiest fruits cannot be grown with success. On the northern slopes of the main Divide westward of Woodend, where the soil is a red volcanic loam, the destruction of timber round the holdings has made it difficult to raise crops of pulse, where heavy yields were once the rule, while the yields of oats and potatoes vary greatly according to whether the fields are protected or not by belts of the neighbouring forest. Moreover, it is admitted by the settlers themselves that the naked stretches of country are subject to severer frosts than those which are protected, and it is a common sight to see potato lands in the open burnt up from this cause, while well-sheltered fields are scarcely touched.

Instruction in Forestry.

A forest school, the first of its kind in Australia, has been established at Creswick, on the Dividing Range, some 10 miles northward of Ballarat. Pupils are accepted between the ages of 14 and 16, after passing a competitive and medical examination, and are required to go through a course of training for three years. The aim of the Forest Department throughout has been to give students a thorough training in practical forestry, whilst giving class teaching its due place. The subjects taught are—English, Arithmetic, Algebra, Botany, Geology, Physics, Chemistry, and Surveying. Daily instruction is also given in a large tree nursery near the school, where the annual output is over 4,000,000 plants. A pine plantation of some 700 acres bearing conifers from 12 to 22 years old surrounds this nursery, and the students are given regular training in planting, thinning, measurement, and estimating of timber crops, felling, and conversion of timber, on this area. In the vicinity there are also two large reserves of natural forest. In these, students have the opportunity of studying the habits, growth, and methods of felling and converting eucalyptus timber.





CRESWICK STATE NURSERY AND PLANTATION.

ECONOMIC GEOLOGY AND MINERAL RESOURCES OF VICTORIA.

By H. Herman, B.C.E., M.M.E., F.G.S., Director of Geological Survey.

CONTENTS.

1. INTRODUCTION.
2. PHYSIOGRAPHY.
3. THE STRATIGRAPHICAL SUCCESSION—
 - (a) Metamorphic Rocks.
 - (b) Cambrian.
 - (c) Ordovician—Lower and Upper.
 - (d) Silurian—Lower and Upper.
 - (e) Devonian—Lower, Middle, and Upper.
 - (f) Carboniferous and Permo-Carboniferous.
 - (g) Jurassic.
 - (h) Cainozoic—Oligocene to Recent.
4. GOLD MINING—
 - (a) Geographical distribution of the gold-fields.
 - (b) Lode Mining—Ballarat, Berringa and Scarsdale, Daylesford, Bendigo, Castlemaine, Maldon, Lauriston, Maryborough, Clunes, St. Arnaud, Stawell, Walhalla, Wood's Point, Bethanga, Cassilis.
- GOLD MINING—*continued*—
 - (c) Alluvial Mining—Deep leads, shallow deposits; bucket-dredging and pump sluicing; nuggets.
5. COAL—
 - (a) Bituminous Coal.
 - (b) Brown Coal.
6. OTHER ECONOMIC PRODUCTS—
 Antimony, Arsenic, Bismuth, Copper, Iron, Lead, Manganese, Molybdenum, Platinum, Silver, Tin, Tungsten, Zinc, Diatomaceous Earth, Gypsum, Magnesite, Marble, Mineral Springs, Underground Water, Other Minerals.
7. PROBLEMS AWAITING SOLUTION.

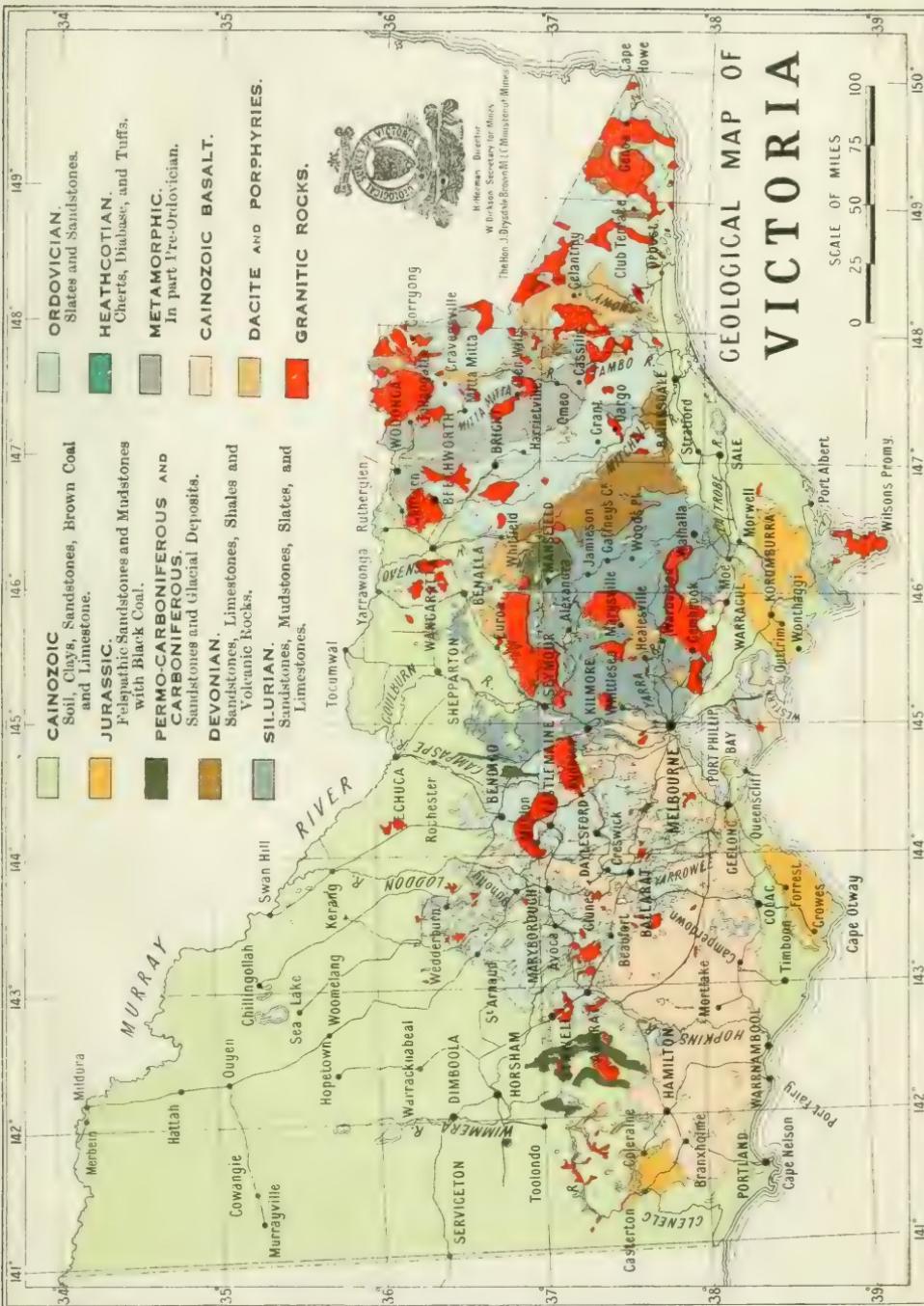
I.—Introduction.

The area of Victoria is about 87,884 square miles. Palaeozoic and older rocks occupy about 26,900 square miles of its surface, Mesozoic about 1,900 square miles, Cainozoic about 59,000 square miles.

Geological investigation in Victoria has progressed mainly along paths leading to the solution of economic problems. Founded in 1853, with Selwyn as first director, the State Geological Survey has ever since made gold-mining its chief consideration. The present tendency is to devote a larger share of attention to other metallic minerals and coal, as well as to the various materials used in trade and manufacturing industries. Purely scientific work has not, however, been entirely neglected. To University, Museum, and private workers is due most of our palaeontological and much of our petrological knowledge, as well as many important investigations in the field.

About 8,000 square miles has been surveyed in moderate to close detail, while a large proportion of the remainder has been examined sufficiently closely to enable a fairly accurate representation to be made on the published maps of the geology of the State as a whole.

The visitors for whom this is written will have but a few days in the State, and probably an hour or less during that period to devote to literature dealing with its geology and mining. Brevity will therefore be taken as the essence of the contract.



As a first step, inspection of the geological and topographical maps (Plates I. and III.) conjointly will facilitate an understanding of the physical geography, of the distribution of the various geological formations, and of the remarks that follow on the geological structure, physiography and various mineral fields.

2.—Physiography.

Victoria consists in the main of highlands and plains. If the Eastern Australian highlands stretching north and south from Cape York to Victoria be regarded as a long leg, the Victorian extension is in the shape of a small foot running westerly for about 400 miles, and irregularly descending, principally in a succession of peneplains, from heights exceeding 6,000 feet on the east till it disappears under the Murray and coastal plains, a few hundred feet above sea level, to the west of the Grampians, Serra, Victoria and Black Ranges, a detached group of meridional ridges of Lower Carboniferous sedimentaries, rising to a maximum height of nearly 4,000 feet, and suggesting a brave but futile final effort of the highlands to escape submergence below the Cainozoic seas. The highlands consist almost entirely of Carboniferous, Devonian, Silurian and Ordovician sedimentary rocks (with interstratified volcanic rocks in places highly developed) and plutonic massifs of granites, granodiorites, porphyries, &c. Great physiographic changes can be partly demonstrated and partly conjectured to have taken place during Mesozoic and Palæozoic times; but there is clear evidence that the present physical features are mainly of Cainozoic development. Marine beds, probably Miocene, have been proved by boring at Portland at 2,265 feet below sea level; fully 3,000 feet of Cainozoic vertical erosion and denudation can be clearly traced in the highlands (see Fig. 16); extensive faulting during the same period has been revealed by surface observations and boring operations. Details cannot be entered into here.

3.—The Stratigraphical Succession.

The various series of detrital and volcanic rocks are shown in Table I. Table II. shows separately the igneous rocks—intrusive, effusive, and plutonic.

TABLE I.—DETritAL AND VOLCANIC ROCKS.

Recent	..	..	Recent alluvial deposits, sand dunes, &c.
Pleistocene	..	..	Superficial shell beds fringing the coast in certain parts of South Gippsland, the Western District, and around Port Phillip. River gravels and terraces in the valleys of existing streams. Old sand dunes of Sorrento and Warrnambool. ? The latest basalts.
Pliocene (Kalimna)	..	..	Marine beds fringing the south coast and covering the Mallee, the Gippsland plains, Cape Otway District, Muddy Creek (near Hamilton), Beaumaris, &c. The Newer Basalts (in part). The alkali volcanic rocks of Macedon, Omeo, Coleraine, Mount Leinster, &c. The brown coal deposits (in part). ? Deep leads of Ballarat, the Loddon Valley, &c.

TABLE I. DETRITAL AND VOLCANIC ROCKS -continued.

Miocene (Janjukian)		Extensive marine beds underlying Pliocene deposits in Gippsland, the Geelong District, the Western District (sub-basaltic), the Mallee, &c.
		? The brown coal deposits of Gippsland, the Bacchus Marsh leaf beds, old deep leads of the Dargo High Plains, &c.
		The Older Basalt.
Oligocene (Balcombian)		Marine beds at Mornington, Muddy Creek, Altona Bay and Sorrento (the last two at a depth), and probably extending under the younger rocks in other parts.
		? Brown coal beds of Mornington and Altona Bay.
Eocene		Not known.
Cretaceous		Not known.
Jurassic		The coal measures of South Gippsland, the Otway district and Casterton.
Triassic		Possibly represented at Newstead.
Permo-Carboniferous		Glaciol deposits and sandstones of Bacchus Marsh, &c.
Carboniferous, Lower		The Grampians sandstones and the Mansfield beds.
Devonian—		
Upper		? Iguana Creek sandstones; sedimentary and volcanic rocks of the Macallister and Wonnangatta Rivers.
Middle		Limestones, shales, &c., of Buchan, Bindi, &c.
Lower		? The Snowy River porphyries; dacites and quartz porphyries of Macedon, the Dandenongs, &c.
Silurian—		
Upper—		
Tanjilian		Grey shales of Tanjil, Starvation Creek, Mount Matlock and Powlett River (bore core).
Yeringian		Sandstones, shales and limestones of Lilydale, &c.
Lower—		
Melbourian		Sandstones and shales of Melbourne, &c.
Ordovician—		
Upper		Slates and sandstones in Gippsland and the North-eastern District, &c.
Lower		Slates and sandstones of West Central Victoria, subdivided by the graptolite fauna into zones.
Dariwil beds.		
Castlemaine beds.		
Bendigo beds.		
Lancefield beds.		
? Cambrian (Heathcoteian)		The diabases, cherts, &c., of Heathcote; limestone, &c., of Dolodrook River.
? Pre-Cambrian		Some schists and gneisses in North-eastern Victoria and the Western District.

TABLE II.—IGNEOUS ROCKS.

		Volcanic.	Hypabyssal.	Plutonic.
Recent to Pliocene		The Newer Basalt series	Basalt dykes of Bacchus Marsh	
Miocene to Oligocene		The alkali series of Macedon, Omeo, Mount Leinster and Coleraine	Phonolite dykes of Omeo; monchiquite dykes of Bendigo, &c.	
Carboniferous . . . .	.. . . .	The Older Basalt series	Basalt dykes of South Gippsland ? Ultra basic dykes of the Walhalla District, &c. ? Felspar porphyrites of the Grampians	Granodiorite porphyrites of Mount William

TABLE II.—IGNEOUS ROCKS—*continued.*

	Volcanic.	Hypabyssal.	Plutonic.
Devonian . . .	? Alkali rocks of Noyang	? Diorite dykes of Gippsland; lamprophyres of Maryborough, Ballarat, &c.; syenite near Talbot; quartz porphyry near Melbourne, Bacchus Marsh, &c.	
Upper . . .	Mount Wellington rhyolites, quartz porphyries and melaphyres		
Middle . . .	The Buchan felsites ? Diabases and andesites of Buchan District		
Lower . . .	? (a) Snowy River porphyries; ? (b) dacites and quartz porphyries of Macedon, Dandenong, Strathbogie, Grange Burn, &c.	... . . .	? Granodiorite of Mount Alexander and many other localities; granite of Beechworth, &c.
Silurian Upper	May include (a) and (b) above		
Cambrian or older	? The diabase series of Heathcote	... . . .	? The serpentine of Mount Wellington; ? intrusive rocks of the Heathcotic; some schists and gneisses in the North-east are probably metamorphosed plutonic rocks.

(a) METAMORPHIC ROCKS.

Among the oldest rocks known, the most widely distributed are the schists and gneisses, which occur in north-eastern Victoria and in the Glenelg River watershed near the South Australian border. In the former district they occupy a large area of the highest portion of the Victorian Alps, while in the latter they are exposed chiefly in the valleys dissecting a Cainozoic coastal plain. The age of these metamorphic rocks is in much doubt. Near Tallangatta, almost normal slates and sandstones, probably of Ordovician age, with a prevailing easterly dip, appear to pass gradually into phyllites, schists, and gneisses to the east and west; further east the gneiss appears to merge into granite. Here the schists may be altered Ordovician rocks. At Yackandandah, about 30 miles westerly, it appears that Ordovician rocks may overlie and have been derived from the disintegration of schists, which may be Archaean: this is the view of Professor J. W. Gregory. Whatever the age of the metamorphism, it has apparently been of a regional character. Wherever the granites or granodiorites have obviously intruded normal Silurian or Ordovician sediments in any part of the State, the metamorphism has been confined to a contact zone, and in degree has been restricted to the development of phyllites and hornfels.

Near Bendigo this contact zone is about 25 chains wide; around the Baw Baw granodiorite it is about half a mile. Dr. A. W. Howitt, after much petrological research at Upper Dargo and Mount Leinster, states that in each case there is a group of mica schists into which the sedimentary (Ordovician?) rocks pass, and another group of mica schists and gneisses, which are clearly metamorphosed granites and diorites. He laid down the rule that, in the Omeo District, where the crystalline schists contain fragments of felspar in their foliations, they are metamorphosed igneous rocks; when they are simply mica schist without traces of felspars, and are connected by gradations with the sedimentary rocks, they are metamorphosed representations of the latter. A close examination of three apparent contacts between the sediments and plutonic rocks showed in each case a series of schists between the two classes of rocks without there being, in truth, any passage from one group to the other.

The Glenelg River metamorphic area has not yet been closely investigated.

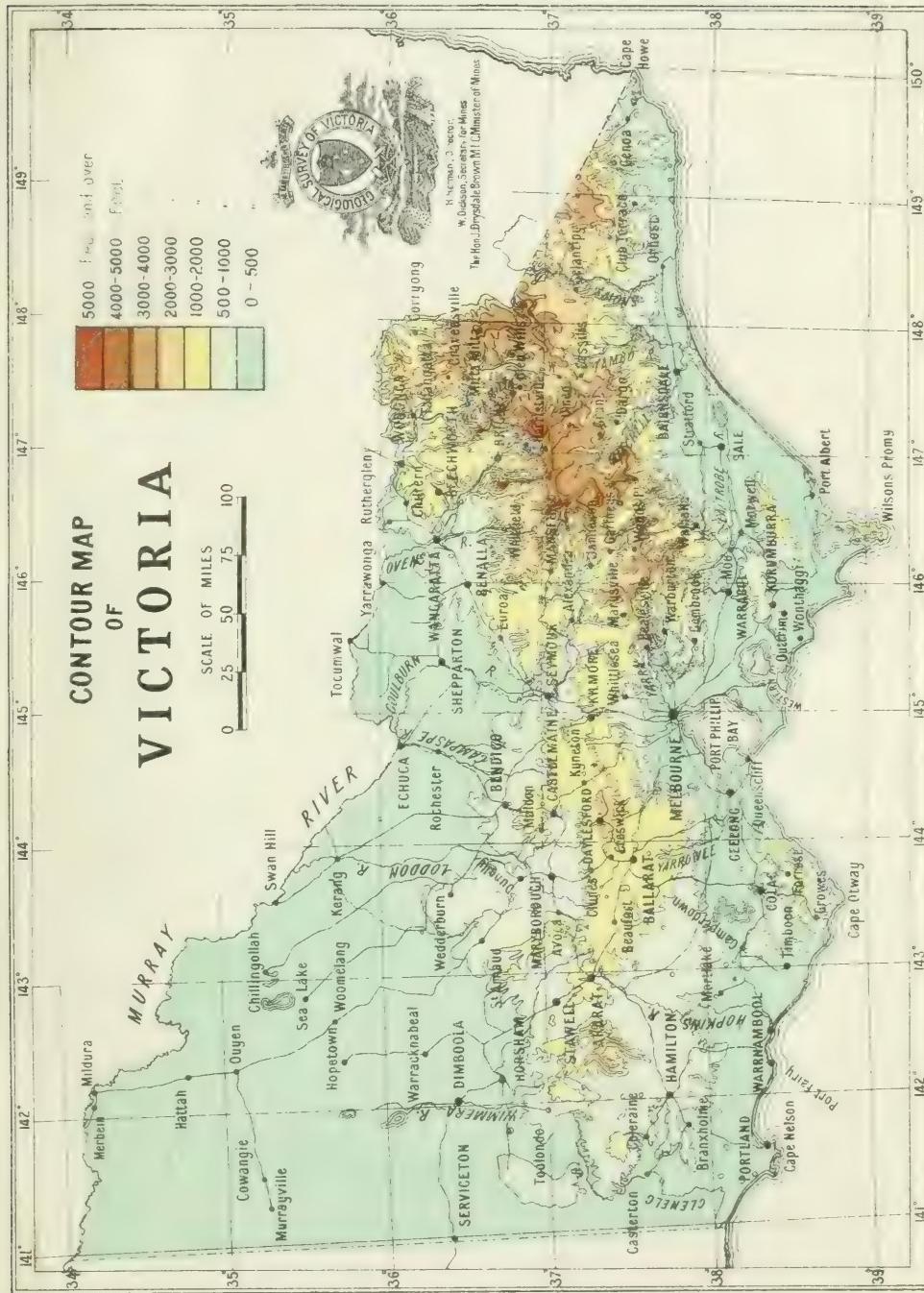
Many metalliferous mining areas occur in the metamorphic rocks, the chief of which are the Bethanga, Omeo, and Cassilis gold-fields, and the stanniferous dykes of the Upper Murray district generally.

(b) CAMBRIAN.

Interest in pre-Ordovician rocks in Victoria has been directed chiefly to an igneous and sedimentary group typically occurring at Heathcote, and termed by Professor Gregory the Heathcotian series. These consist mainly of diabase lavas, tuffs and intrusions, with porphyries, microgranites, granophyres and cherts. The area has been investigated by E. Lidgey, E. J. Dunn, Dr. Howitt, Professor Gregory, and Professor Skeats, more particularly by the three last named. The various observers are not in complete agreement as to the intrusive character or otherwise of certain of the rocks, nor as to the stratigraphic relations either of the diabase to the chert or of the diabase and chert series as a whole to trilobite-bearing beds close by, which on palaeontological evidence were originally placed by Etheridge as Cambrian, and later by Gregory and Chapman as Ordovician. On recent additional information, Chapman is inclined to place them again in the Cambrian. In Howitt's view the diabases are intrusive into the Ordovicians and the cherts are Ordovician rocks altered by contact metamorphism. Dunn and Gregory regard both cherts and diabases as pre-Ordovician and say that the Ordovician sediments rest on them unconformably. Dunn regards the diabases as mainly lava flows, Gregory as intrusive into the cherts. Skeats claims that at Heathcote and elsewhere the field evidence shows that the cherts and diabases directly and conformably underlie the normal sediments, that the cherts and diabases are interbedded, that some of the cherts are tuff beds metasomatically altered, and that the bulk of the diabases are of volcanic origin. He regards the whole series as not older than Cambrian.

At Dolodbrook River also, near Mount Wellington, North Gippsland, occurs a trilobite-limestone placed by Chapman in the Upper Cambrian. Cherts resembling those at Heathcote appear in many parts of the State, and have been taken as evidence of the occurrence there of the Heathcotian series. However, at Dolodbrook River, Tatong and Aberfeldy River similar cherts are found interbedded with or stratigraphically above slates containing Upper Ordovician graptolites.

**CONTOUR MAP
OF
VICTORIA**



The Cambrian rocks have not been sufficiently well defined to show to what extent, if any, they were responsible for the rich alluvial gold deposits of Heathcote, where magnesite and steatite are now being worked in the diabase. Corundum occurs at Heathcote and Dolodrook River.

(c) ORDOVICIAN.

The most widely distributed and economically important of all the pre-Tertiary rocks are the Lower Ordovician. These have furnished the greater part of the gold-yield of the State, and consist everywhere almost entirely of sandstones and highly-cleaved slates, folded into geosynclines and geanticlines, with innumerable minor acute folds and corrugations. Thin beds of conglomerate and limestone occur rarely. The slates contain a rich graptolite fauna, by the aid of which Dr. T. S. Hall has divided them into four zones, named, after the type localities in which they occur, as follows :—

- | | |
|-------------------------|-------------------------|
| 1. Lancefield (oldest). | 2. Bendigo. |
| 3. Castlemaine. | 4. Darriwil (youngest). |

Excepting a small area in the Mornington district, Lower Ordovician rocks are not so far known definitely to occur east of the meridian of Melbourne. In this region (nearly the eastern half of the State), which over large areas has been only cursorily examined, there is an extensive development of Upper Ordovician slates and sandstones containing in places ores of silver-lead, copper, iron and manganese, none of which has so far proved important, as well as numerous highly productive gold-fields, including the bucket-dredging valleys of the Ovens and Buckland Rivers, many alluvial gold-fields, and the lodes of Harrietville, Grant, Bulumwaal, Stirling and Club Terrace.

Many of our gold-fields in the Lower Ordovician have not yet been placed in their subdivisional zones; but we know that Bendigo and Castlemaine beds occur at Bendigo, Castlemaine, Chewton and Steiglitz; Bendigo and Lancefield at Rocky Lead and Inglewood. At Daylesford three zones are represented—Castlemaine, Bendigo, and Lancefield. Most of the "indicator" gold-fields (referred to later) are in Lancefield beds, as at Bealiba, Goldsbrough, Dunolly, Tarnagulla, Inglewood and Maryborough. Ballarat may be in the Lancefield zone, but this is very uncertain. The Darriwil beds are not apparently of wide extent, and so far no important mineral field has been found in them.

(d) SILURIAN.

Sandstones and mudstones, with subordinate conglomerates and limestones, folded and corrugated like the Ordovician rocks, and in places highly fossiliferous, cover a large part of Central Victoria. In ascending order they have been divided into three series—Melbournian, Yeringian and Tanjilian. The last has a very strong Devonian element. The chief economic features of the Silurian rocks are the association of auriferous quartz lodes with quartz-diorite dykes, the occurrence of gold-antimony lodes, and the production of limestone for lime and cement manufacture. The richest auriferous lode in the State (Cohen's reef at Walhalla) is in corrugated thin-bedded slates and sandstones of Upper Silurian or (possibly) Lower Devonian age. Platinum in appreciable quantity occurs at Thomson River and Matlock in cupriferous diorite and peridotite dykes.

(e) DEVONIAN.

Slates, shales, sandstones and quartzites, with thin-bedded limestones, at the junction of the Wentworth and Mitchell Rivers, known as the Tabberabbera shales, are regarded by McCoy and Chapman as belonging to the same series as several large masses of limestones in the Buchan district, 40 or 50 miles further east. The upper beds at Walhalla may possibly be Lower Devonian in age. Other Lower Devonian rocks may be the Snowy River porphyries of the Snowy River district, forming an aggregate thickness of 2,000 feet or more of acidic bedded ash, volcanic agglomerates and lavas, with masses of granite-porphyry, quartz-porphyries and allied rocks, which A. W. Howitt suggested may be the plugs of Lower Devonian vents; the dacites and quartz-porphyries of Macedon, the Dandenong Ranges, &c. In the Federal Territory volcanic rocks resembling the Snowy River porphyries are Upper Silurian; in the neighbourhood of Yass, some 30 miles to the west, a similar series is Lower Devonian. There is no strong direct evidence to show which system the Victorian series should be placed in. The numerous masses of granite and granodiorite widely distributed throughout the State were probably intruded in Lower Devonian times, although at Mount William there is evidence of intrusion of granodiorite-porphyrite into the Grampian sandstones, which are probably of Lower Carboniferous age. The Mount William (near Ararat), Mount Wills, Granya and other gold-fields are in granodiorite or granite. Silver-lead lodes of minor importance occur in the Buchan limestones and in the Mount Deddick and Tintaldra granodiorite. At Mount Deddick copper ores occur, but have not yet proved to be of commercial value. At Iguana Creek, on the Lower Mitchell River, sandstones with *Cordaites* and other plant remains were regarded by McCoy as Upper Devonian, and consequently a large tract of country between the Macallister and Wonnangatta Rivers, occupied by sandstones, conglomerates, grits, mudstones and micaceous shales, with interbedded porphyries and melaphyses, was placed in the same system. A smaller area of similar rocks is at Mount Tambo. It is quite likely, however, that the greater portion of these areas will have to be placed with the Mansfield and Grampian series, into which there may be an upward passage. An isolated, but rich, vein of gold near Briagolong is the only auriferous occurrence known in these rocks. Freestone has been quarried here and there in the Upper Devonian sandstones. The granodiorites and granites in many places are quarried for building stones, and where decomposed are in many places worked for pottery purposes. First-class felspars for glazing are in the granite at Lal Lal, Strathbogie, Beechworth and Dunolly.

(f) CARBONIFEROUS AND PERMO-CARBONIFEROUS.

In the Western District are the Grampians and Serra, Victoria and Black Mountains, an approximately parallel series of three ranges of the horst type, already referred to under Physiography. These ranges are built of coarse to fine sandstones, with occasional shales, not folded, generally low-dipping, but in places tilted at angles up to 30° or 40° .

In the Mansfield district is a thick series of coarse and fine sandstones, conglomerates, mudstones and shales, with occasional impure limestones. The central portions of these rocks are nearly horizontal, while towards their boundaries they assume steep dips.

On palaeontological evidence all the above rocks have been classed by Smith Woodward and Chapman as Lower Carboniferous. In New South Wales an equivalent series is placed in the Upper Devonian. Freestone for building purposes has so far been the chief product.

Glacial conglomerate and boulder till occur at Bacchus Marsh, Heathcote, Rutherglen and Beechworth district, Glenrowan, Campbelltown, Wilby and Coleraine, and underlie deep leads at Creswick, Carisbrook, Pitfield and Tarnagulla. The conglomerates have abundant scored and striated pebbles and boulders, chiefly granites, porphyries, gneisses, schists, cherts, quartzites, sandstones and slates, of which some types have not yet been recorded *in situ* in Victoria. Very large erratics occur, especially in the Heathcote area. At Bacchus Marsh a series of sandstones and shales containing *Gangamopteris* overlie the glacial conglomerates, and in one locality they are seen interbedded with the conglomerates. The whole series throughout the State is provisionally classed as Permo-Carboniferous. Freestone is so far the only economic product of these rocks.

(g) JURASSIC.

About 1,900 square miles, in three localities, of Jurassic shales, felspathic sandstones and mudstones, with occasional conglomerates, appear at the surface in addition to an unknown, but large, extent underlying Cainozoic rocks. In the Western or Wannon area a few thin coal seams have been found; in the Central or Otway area no known seam exceeds 12 inches; in the South Gippsland area seams of bituminous coal up to 10 feet thick have been worked. The dip of these rocks is very inconstant; they are much faulted and unevenly bedded (see Figs. 17, 18). Dolerite dykes occur plentifully in the South Gippsland beds.

Many large buildings in Melbourne are built of Jurassic freestone from Barrabool Hills, near Geelong.

(h) CAINOZOIC.

Marine, freshwater, fluviatile and volcanic rocks from Oligocene age to Recent are widely distributed. After their type localities the marine beds are named and divided as follows:—

Balcombeian (*Oligocene*).—Occur on the eastern coast of Port Phillip at Balcombes Bay; on the western side of Port Phillip, at Newport and Altona, under basalt; and at Muddy Creek, near Hamilton. At Newport and Altona, under the marine sands, clays and limestones are estuarine and freshwater sands, clays, conglomerates and seams, up to 140 feet thick, of brown coal. Silurian strata underlie the whole.

Janjukian (*Miocene*).—At Spring Creek (parish of Jan Juc) and numerous localities along the greater part of the coast both east and west of Port Phillip: in the Western District, south of the Main Divide, appearing in many places at the surface and also underlying large areas of volcanic rocks; and in the Mallee (in the north-west of the State), underlying Pliocene beds. The greatest thickness of the known Cainozoic beds belongs to this period. With it are associated basaltic flows that marked, perhaps, the inception of Cainozoic volcanic activity that continued more or less persistently until comparatively recent times.

Kalimna (Pliocene).—At Kalimna (Gippsland Lakes); on Port Phillip at Beaumaris, Brighton and Flemington; at Shelford, Muddy Creek, Glenelg River, Horsham and the Mallee. The Pliocene period is generally characterized by coarse sediments of both marine and freshwater origin. Some gigantic mammals are included in the fauna. Large Pliocene areas are probably overlain by basalt.

Beds of Recent age, and still in process of formation, are the aeolian deposits along the coast and in the Mallee.

The succession of the Cainozoic rocks in a bore 1,696 feet deep at Sorrento has been investigated by Mr. F. Chapman. To 430 feet deep was more or less consolidated dune sand, with occasional bands of brown clay; then Recent estuarine beds to 585 feet; thence to 730 feet were Pliocene shelly sands and grits passing downward into Miocene beds. A typical Oligocene marine fauna showed from 1,310 feet downward.

Many bores put down for water supply purposes in the Mallee indicate that the Oligocene sea did not extend so far inland; otherwise there is the same succession as at Sorrento.

From the Main Divide of Cainozoic times ran both northerly and southerly numerous river valleys, containing in their beds the rich auriferous concentrates of the erosion of huge masses of lode-containing Palaeozoic rocks—chiefly Lower Ordovician strata. The age of these ancient rivers is uncertain; probably some of them date their small beginnings as far back as the Mesozoic era. Certainly some valleys were comparatively old when the process of filling up by fluvial and volcanic material started—perhaps in early Cainozoic times. These ancient valleys are the present “deep leads” of the miner, or are represented by still older sub-basaltic “reef washes” (terraces) or exposed high-level gravels, the remnants of river systems largely obliterated by horizontal deviations of drainage lines and constant vertical erosion.

The Cainozoic igneous rocks are mostly volcanic. They include the vast volcanic plains of Western Victoria, with numerous scoria cones, and ash and lava beds; remnants of basalt flows in the eastern highlands capping ranges over 5,000 feet above sea-level; and an alkali series of lavas, plugs and dykes in the Mount Macedon, Omeo, Mount Leinster and Coleraine districts.

In the various Cainozoic areas and deposits the important economic products, besides gold, are stream tin, building sands, gravels, limestones, pottery clays, road metal, building stones, diatomaceous earth and brown coal. The brown coal beds are probably the thickest in the world.

4.—Gold-mining.

The outstanding feature of Victoria's history has been the phenomenal richness of her gold-fields. In 1849, gold was obtained in the Pyrenees Ranges, but the mining history of the State dates from 1851, when a reward of £200 was offered for the discovery of a gold-field within 200 miles of Melbourne.

The effect was magical. During the year Clunes was discovered about 1st July, Anderson's Creek on 5th July, Hiscocks, near Buninyong, on 8th August, Ballarat on 8th September, Bendigo on 10th December. The discovery of other fields followed. In 1852, 40,000 men were camped at Ballarat, 25,000 at Mount Alexander (Castlemaine), and 40,000 at Bendigo; the gold-yield for that year was 2,286,535 oz.

As the result of the gold discoveries and the subsequent extensive rushes, new towns sprang up in many parts of Victoria, and several permanently maintained the foothold thus obtained. Both Ballarat and Bendigo owe their positions as second and third cities in Victoria to the impetus given to them by the discovery of gold and its development.

The yield of gold from alluvial and quartz mining from 1851 to 1913 is 73,483,148 oz., valued at £293,550,927.

(a) GEOGRAPHICAL DISTRIBUTION OF THE GOLD-FIELDS.

The Victorian gold-fields may be conveniently divided into three main areas:—The Western, or that embracing the Lower Ordovician formations, in which much deep quartz-mining has been done (to a maximum depth of 4,600 feet), and from which the famous leads drew their gold supplies; the Central or Silurian area, including the Walhalla, Wood's Point and Upper Yarra fields, in which the Long Tunnel or Cohen's line has been worked to 3,600 feet deep; the Eastern, taking in both the Upper Ordovician of Bulumwaal, Grant, Harrietville and Bright, and the extensive metamorphic series of the Bethanga, Mount Wills and Cassilis districts.

The various sedimentary beds in the areas described have been more or less bent into folds, along which denudation has exposed recurring series of strata at the surface, which may help to explain the distribution and position of many of the Victorian gold-fields. It appears probable from all the evidence available that distinctive auriferous stratigraphical zones of greater or less thickness and importance may eventually be recognised in Victoria, but extensive structural surveys and palaeontological investigations are required before sweeping generalizations will be justified. Probably the most definite evidence in this direction has been obtained from the researches of Mr. W. Baragwanath at Ballarat West. Dykes of various types and ages are found in close association with many of the auriferous reefs, those of the diorite type being important in the Silurian areas, while lamprophyres are directly connected with some reefs in the Lower Ordovician formations. Some of the fields are similar, but many of them differ in geological structure, and have distinct quartz occurrences, such as the Bendigo saddle reefs, the Ballarat zone lodes, and the dyke reefs at Walhalla and Wood's Point. Quartz-mining is in progress on most of the gold-fields, some of the more important of which will be further described.

(b) LODE MINING.

In addition to the gold-fields mentioned hereunder, minor fields could be enumerated by the score, but space quite prohibits description of any but a few of the more important. Some of the individual lodes in the minor fields have produced several hundred thousand pounds worth of gold, and have been very profitable.

BALLARAT.

Ballarat gold-field is in Lower Ordovician slates and sandstones, possibly Lancefieldian, acutely but irregularly folded into synclines and anticlines. The strike of the axial lines is nearly north and south.

Ballarat East and Ballarat West has each its own distinctive structure.

In Ballarat East only the eastern dipping beds have proved auriferous. Extensive north-and-south faults, known as leather-jackets, having 45° to the west, form the footwall side of extensive "mullocky" lodes

(quartz veins and country rock), which have been stoped in places for 100 feet in width. Formations of this class (see Fig. 1) are of most importance on this field, and can be traced for hundreds of feet within a series of favorable beds, 350 feet in width, which have produced enormous bodies of payable quartz.

Another type of quartz formation is associated directly with the anticlinal folds, such as the Roberts' lode of the old Llanberri company, which was worked for twenty years. One lode in the Britannia United ground was closely analogous to a saddle.

Irregular fault-veins and spurs are found throughout the field, generally small and widely separated, but extensive payable stockworks have been mined.

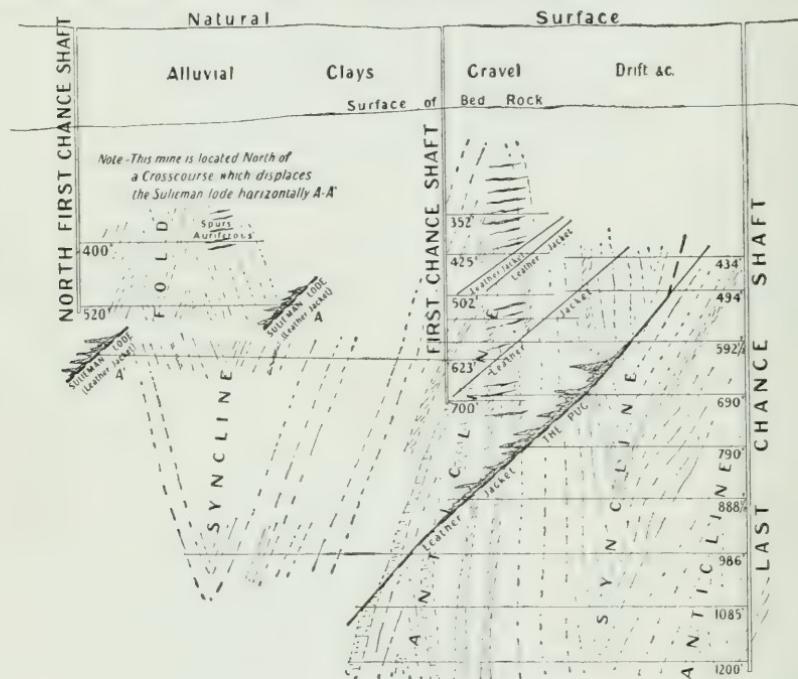


FIG. 1.—Transverse section of Ballarat East gold-field, looking north. The most productive portion is between the anticline at the First Chance shaft and the syncline to the east.

(Scale—360 feet to an inch.)

The well-known "indicators" of Ballarat East are thin pyritic seams and beds of slate occurring in the 350 feet width of favorable beds above referred to. Typical and most important is The Indicator, a pyritic seam interbedded with the strata. At the intersection of The Indicator and numerous quartz veins which cross it, rich deposits (sometimes in slugs of gold weighing hundreds of ounces) frequently are found. Ballarat East has usually been regarded as an indicator field only. The large quartz formations have, however, yielded probably three times as much gold as the indicators.

A broader and probably more practically useful view is that the 350 feet width of strata is not only gold-bearing at and along the indicators (of which a dozen or more have been identified), but is more or less favorable throughout.

Analogous conditions exist on a parallel fold to the west, where the Sulieman Pasha mine worked a large leather-jacket formation to a depth of 1,000 feet. Mining below 1,200 feet deep in Ballarat East has not been extensive, and besides deeper work in the present mines there should be future developments of the indicator belt on its extension to the north (beyond Black Hill) and south (beyond a large crosscourse), as well as to the east and west on the recurrence of the favorable zone on parallel folds.

With the exception of a couple of acres—now closely built upon—in the neighbourhood of the fire station, Sturt-street, the whole of the Ballarat West and Sebastopol mining field is covered with layers of basalt. These layers (four in number) vary in respective thickness; the upper averages

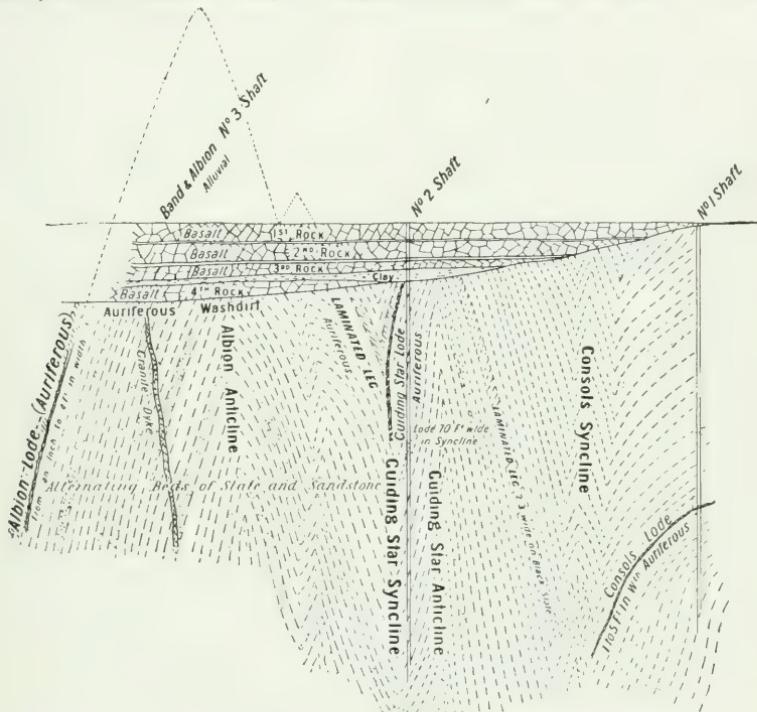


FIG. 2.—Transverse section of Ballarat West gold-field, looking north, showing payable lodes on west-dipping sides of folds, four basalt flows, and auriferous sub-basaltic lead.

(Scale—1,000 feet to an inch.)

about 90 feet; the second is 100 to 120 feet; the third and fourth flows generally fill the valleys and vary considerably in thickness on that account, but approximate to 60 feet for the third and 80 feet for the fourth. In a total average depth of 400 feet, about 330 feet is basalt, the balance being intervening clays and drifts, with "headings" and "wash" below the bottom layer (see Fig. 2).

Exceedingly rich alluvial gold was won from the deep ground (gutters), and also from the higher or "reef" washes, in places 100 feet above the gutter. Alluvial gold has been won from drifts between the basalt flows, but these drifts were never profitable to any great extent.

The structure of the field is exposed in long crosscuts, rendered necessary in the various mines on account of the overlying basalt and the ill-defined record of the site of quartz reefs passed through in the early alluvial workings. These long crosscuts in many places appear ill chosen from a mining point of view, but were, at times, almost essential, because of the difficulty of securing better shaft sites clear of the water-logged alluvial.

The most striking feature in the structure of the field is that, although shaft sinking and long crosscuts have intersected the anticlines and synclines, all the lodes worked, except the Phoenix, are in one favorable zone, from 60 to 80 feet in thickness. This favorable zone is characterized by the presence of a number (never more than four) of black, highly graphitic beds of slate. On the black slates slipping has taken place and laminated quartz has been deposited. Black slate and laminated quartz are typical of the three main lines of lode, and though at times large masses of spurs and barren quartz may accompany the laminated quartz, the latter is never absent, and commonly occurs on one or other wall.

Payable lodes have so far been found only on the west-dipping sides of the folds and in the 80-ft. zone. Along the laminated quartz are thicker quartz bodies, which have proved highly profitable; the largest formations have been on the folds. The chief lines of lodes from east to west are the Consols, Guiding Star and Albion; the latter is known at the southern end of the field as the Prince of Wales. The Consols lode has been 70 feet wide on the anticline, and averaged 4 feet down to 1,000 feet deep in the highly payable Band and Albion mine. Following a southerly pitch, this lode was worked to nearly 3,000 feet deep in adjoining mines. Northward from the Band and Albion the Consols lode was worked to the syncline, where the formation was 50 feet wide, at a depth of 2,200 feet. Below the syncline, crosscutting at 2,300 feet deep failed to reveal the formation. Further north the lode was worked by other mines. The Guiding Star lode was payable for 5,000 feet in length, and for a height of 200 to 900 feet above the syncline. The Albion line of lode has been traced for 4 miles. The black slate horizon on this line carries from 1 inch to 3 or 4 feet of laminated quartz, with in places 10 to 15 feet of quartz spurs adjacent.

The Albion anticline has been denuded for several thousand feet, shedding the rich alluvial gold for which this part of the field became famous. Fig. 2 shows a section at the Star of the East mine (now closed), where crosscuts of nearly 2,000 feet each were driven to the Albion lode at 600, 1,100, and 1,500 feet from the surface. Here the lode was of good quality, but worked under most unfavorable conditions. Recently the Central Plateau mine has sunk a shaft, and proved payable stone 600 to 700 feet deep about 1,500 feet south of the old Star of the East workings. A mile and a half south of the Central Plateau the Albion lode was worked many years ago to 1,300 feet deep under the name of the Prince of Wales lode.

Below the favorable black slate zone 1,000 feet of slate and sandstone appears to be barren: above, the Phoenix lode, an inverted saddle, possessed some features in common with the other lodes described; it is about 500 feet stratigraphically above the black slate zone.

The Consols lode awaits further exploration at the northern end of the field; there are still possibilities of successful mining on the Guiding Star

lode, both to the north and south of the mines already worked. The Albion line presents opportunities for important developments, both longitudinally and at greater depths.

Numerous lode mines have been worked at Ballarat West. The most profitable were :—

	Tons.	Oz.	| Dividends.
Band and Albion Consols (Consols lode)	240,287	158,299 | 252,001
Star of the East (Guiding Star lode)	508,539	256,759 | 284,400

The lodes of Ballarat have produced about £5,000,000 of gold.

BERRINGA AND SCARSDALE.

Berringa and Scarsdale are about 4 miles apart on the same meridional belt, in an area of folded slate and sandstone beds, probably of Lower Ordovician age.

At Berringa the lodes are of the saddle, fault and sparry types. Of the saddles the chief are Williams' Fancy and the Birthday Tunnel lodes, which together have yielded 124,418 oz. from 607,952 tons, and paid £92,000 in dividends.

The fault type is represented by the Birthday lode, with an auriferous shoot 1,000 feet in length, and 1 foot to 4 feet (in one place 30 feet) wide in the lower levels. The shaft is 1,030 feet in depth, rich quartz having been mined to a depth of 800 feet. From 122,987 tons the gold won is 72,398 oz., the dividends being £133,800.

The Scarsdale lodes are of three types—

- (a) Those coincident with the strata, small but persistent, and most highly auriferous near the anticlinal apices.
- (b) Those formed on faults cutting the strata and in the vicinity of anticlines pitching south.

The lodes in the New Jubilee mine belong to types (a) and (b); large quantities of profitable low-grade quartz have been mined also from the quartz spurs and masses occurring between two bedded veins. This mine, which was started in 1906, won 30,762 oz. of gold from 104,405 tons of ore, and paid £28,500 in dividends, to the end of 1913.

- (c) A later series of lodes occurs along faults cutting both the strata and other lodes nearly at right angles. The Jubilee lode, which followed a course generally crossing the strata, but at times running with it for a few feet, belongs to this type. It yielded highly profitable returns from a lode up to 8 feet wide. The deepest workings are at 2,020 feet. Dividends of the Jubilee company total £145,800; the gold won is 124,531 oz. from 324,222 tons.

Co-operative parties and mining companies have won from these fields considerable quantities of gold in addition to the yields above quoted

DAYLESFORD.

The Daylesford field is in Lower Ordovician slates and sandstones folded into a series of synclines and anticlines, cut by faults and in parts traversed by dykes. (Figs. 3 and 4.) Lithologically and palaeontologically the beds resemble the central and richest portion of Bendigo; the lode structure more nearly resembles that of Ballarat East.

The Ajax lodes, the most important, have formed in west-dipping faults, which intersect east-dipping favorable beds, and are called "verticals" (Fig. 5); while "flat makes" (Fig. 6) between the faults have also proved rich gold producers.

The Cornish group to the east of the Ajax, and the Rising Star to the south, between the Ajax and Cornish lines, are also fault lodes, striking parallel to the axial lines and dipping west across a series of favorable eastern strata. The faults on which the verticals have formed are a recurring series dying out along the bedding planes where the faults pass the anticlines. In the Ajax mine five verticals have been worked; in the Cornish



FIG. 3.—Plan of Daylesford gold-field, showing axial lines, groups of mines, &c.
(Scale—1 mile to an inch.)

four. The shoot of auriferous stone in the Rising Star was from 2 to 30 feet wide, from 200 to 400 feet in length, and 500 feet in height. Rich sulphides accompany the gold in most of the lodes of the field.

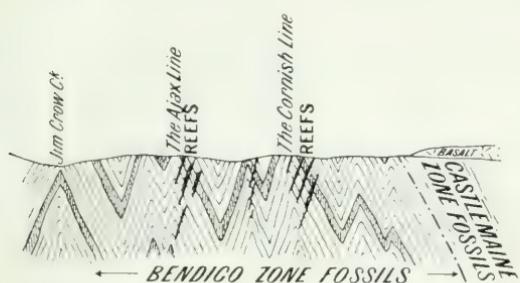


FIG. 4.—Transverse section of Daylesford gold-field, looking north. Principal feature—payable west-dipping and flat lodes in east-dipping strata. Position of section is at about half a mile north of railway station, Fig. 3.

(Scale, Horizontal and Vertical—1 mile to an inch.)

of the richer portions of the lodes with certain beds in the Cornish mines a wide belt of slate was favorable, while in the Ajax a series of beds with numerous quartzite bands appears to have been closely associated with the richer quartz. The quartz in the verticals is usually brecciated, while in the flat makes white barren stone is common. Laminated quartz is confined to veins on bedding planes.

About 1,000 feet is the maximum depth so far reached at Daylesford. Some yields are:—

North Cornish Gold-mining Company (1886–1891) crushed 137,515 tons for 54,920 oz., and paid in dividends £100,500.

Ajax Gold-mining Company (now working) crushed 145,268 tons for 64,801 oz., and paid in dividends £101,250.

Besides these, five other mines have each yielded from £50,000 up to £190,000.

The yield of the field for 1912 amounted to 36,060 oz., and the dividends to £36,900.

The "flat makes" are extensive spurs, frequently upwards of 100 feet in width, with a thickness of 10 or 12 feet, and trend for some hundreds of feet along the strike of the beds. Such formations have yielded much payable stone in the Nuggety, North Nuggety, Central Ajax and Frenchman mines.

A prominent feature in this field is the association

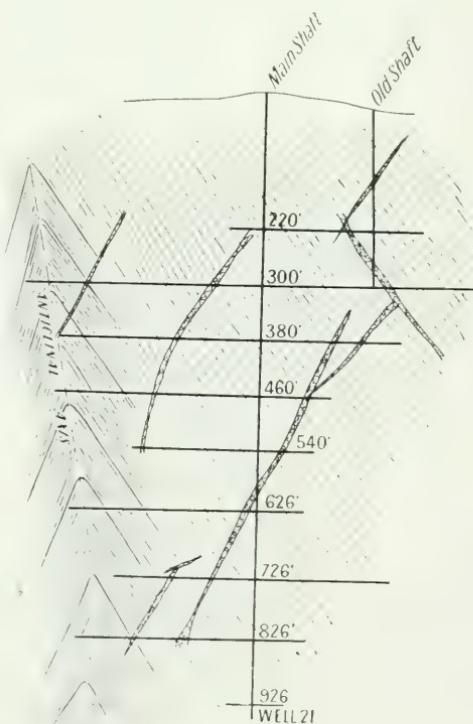


FIG. 5.—Transverse section of Ajax mine, Daylesford, looking north. Payable west-dipping lodes ("verticals") in favorable east-dipping strata.

(Scale—300 feet to an inch.)

BENDIGO.

The Bendigo gold-field, 15 miles long and 3 miles wide, is at present the chief mining centre in Victoria; it has the deepest mines in Australia.

The main feature is the saddle reefs, which conform to the apices and sides of regularly recurring anticlinal folds (Fig. 7.) The reefs are in the shape of a geometrical lune. That portion of the strata about an anticlinal axial plane is termed "centre country," and the line of strike of an anticline ("pitching" northerly and southerly, as well as dipping easterly and westerly from any point, is known as a "dome," a point of quaquaversal dip. Saddle reefs on domes are usually highly auriferous, but rich reefs are not confined to domes. The saddles recur in depth (Figs. 9, 10), and as many as 24 have been passed through in a depth of 2,200 feet. The caps are often 20 to 50 feet across the saddles, and from 20 to 30 feet high, or even 100 feet high in narrow upward extensions. The "legs" (on the dip of the folds) are seldom more than 3 to 4 feet wide, or 100 feet in downward extension. Portions of the field, as on the Pyke line, are characterized by a meagre development of quartz on the saddles and a compensating enlargement of the legs, which are several hundred feet deep and long, and in places highly auriferous. Monchiquite dykes, usually referred to as "lava" dykes or "streaks," follow closely centre country on all the folds (Fig. 7), with little interruption for miles horizontally and thousands of feet vertically; they are of later age than the reefs. Besides the saddles extensive sparry formations have been profitably mined. On the field there are 53 shafts over 2,000 feet deep, 13 over 3,000 feet, and two over 4,000 feet. The Victoria quartz mine, 4,614 feet, is the deepest in Australia.

It has for the last twenty years been generally considered that the central portion of the Bendigo field consists of beds stratigraphically lower than the strata of the surrounding country, the comparative poverty of which was thereby accounted for on the assumption that the beds of the central area had been specially favorable for the deposition of gold. While this may to some extent be true, contributory reasons will require to be forthcoming to explain the gold distribution. Fig. 8, showing the "pitch" along the

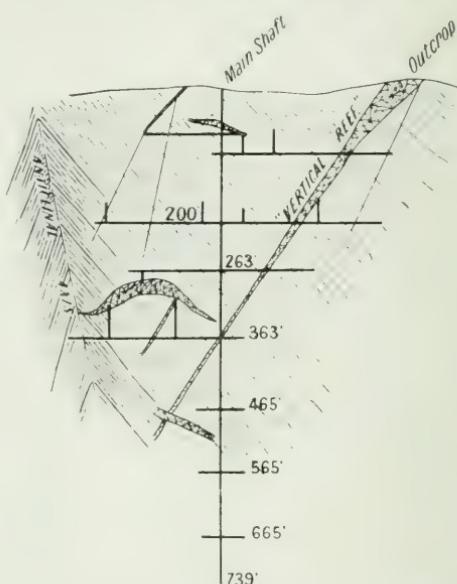


FIG. 6.—Transverse section, North Nuggety Ajax mine, Daylesford, looking north, showing "vertical" reef and rich "flat makes" in favorable east-dipping strata.

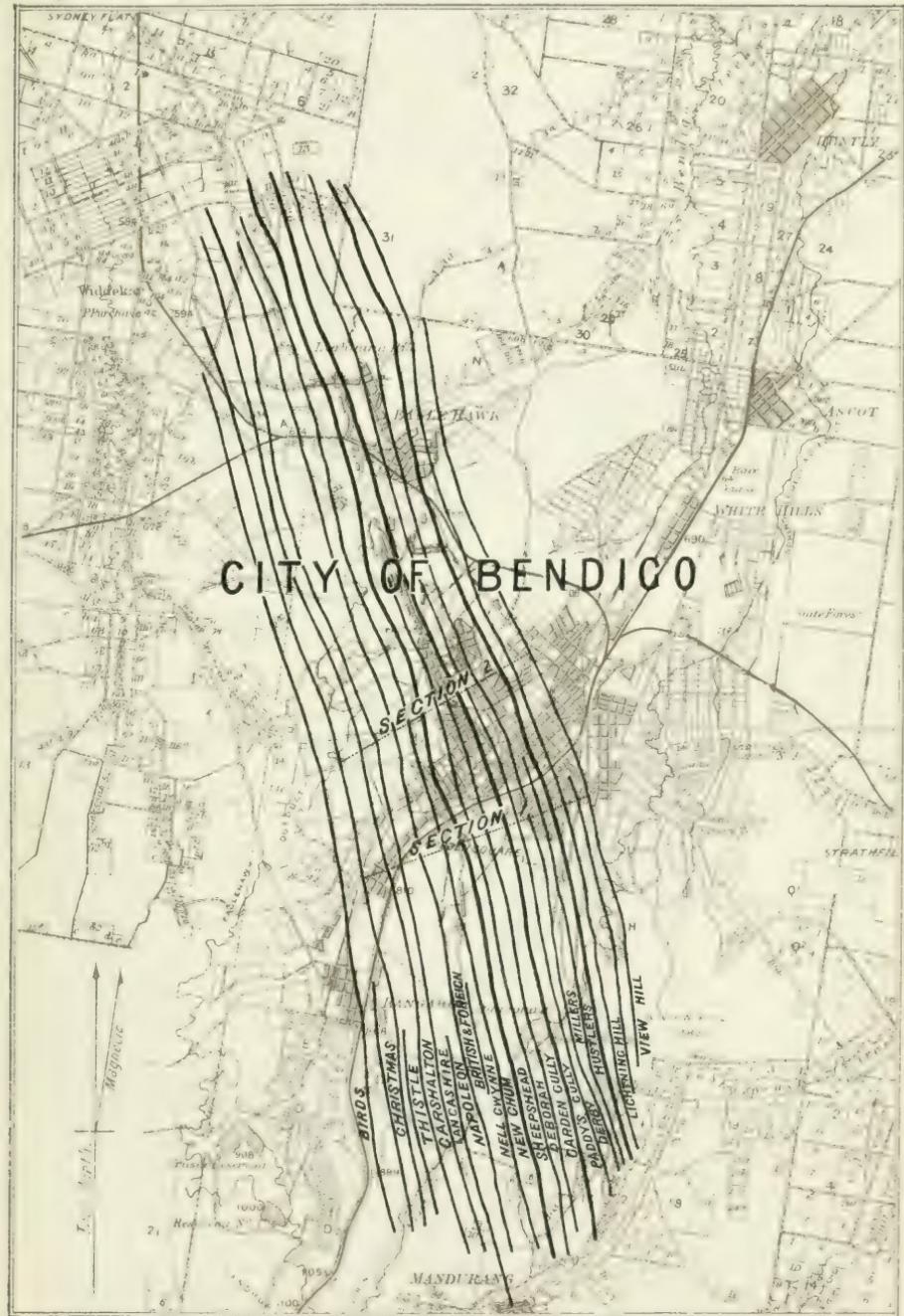
(Scale—300 feet to an inch.)



H. Hartman, Geologist
W. D. McMillan, Geologist
The New Virginia Gold Mine
McMillan & Sons, Miners

ANTICLINAL AXIAL LINES AT BENDIGO.

Scale - 2 Miles to One Inch



Note - The extensions of the axial lines shown have not been surveyed to the north and south.
Parallel axial lines to the east and west of those shown also await survey.

three principal lines, might perhaps be considered to show that the general reason assigned is sufficient, but Fig. 7, showing transverse sections across the field, indicates (by the strong dotted lines, which represent the accepted approximate upper limit of the Bendigo zone) that the existence of higher beds to the east and west of the central area has yet to be demonstrated. In order to obtain more definite evidence on this important point, a survey of synclinal, as well as anticlinal, lines is in progress, so that accurate transverse sections of the field may be

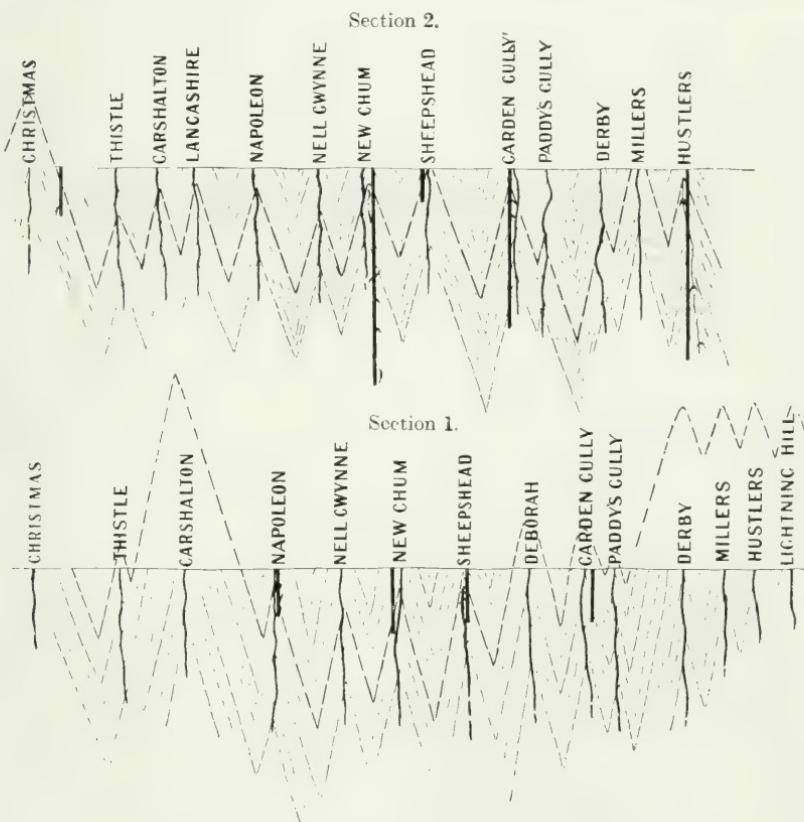


FIG. 7.—Transverse sections of Bendigo gold-field, looking north, showing acute and regular folding of Lower Ordovician slates and sandstones. The thick vertical lines are shafts, the wavy vertical lines the monchiquite ("lava") dykes along each axial plane, and the names are those of the various lines of reef or axial lines. For positions of section lines see Plate IV.

(Scale, Horizontal and Vertical—3,000 feet to the inch.)

constructed. The transverse sections show the nature of the folding and the occurrence of the "lava" or monchiquite dykes along the anticlines.

Bendigo is at present the most important mining field in the State. Its production in 1913 was 168,172 oz. Dividend paying mines have been

numerous. The following may be specially mentioned among present mines:—

To end of 1913.

			Yields.		Dividends.
			Oz.	£	
Garden Gully United	..	..	1,748,766	852,169	
Great Extended Hustler's	..	..	1,137,334	463,000	
Catherine Reef United	..	..	955,091	138,127	
Great Northern	..	..	471,997	173,200	
Koch's Pioneer	..	..	445,787	103,875	
Johnson's Reef Gold Mine	..	..	310,689	328,420	
Clarence United	..	..	329,878	136,125	
South New Moon	..	..	225,603	504,600	
New Moon	..	..	227,825	370,128	

Ten other mines now working have each yielded over 100,000 oz.

The total output from the Bendigo field to the end of 1913 is about 19,700,000 oz., valued at £78,800,000.

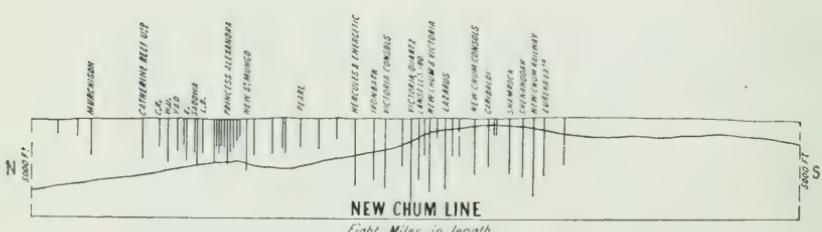
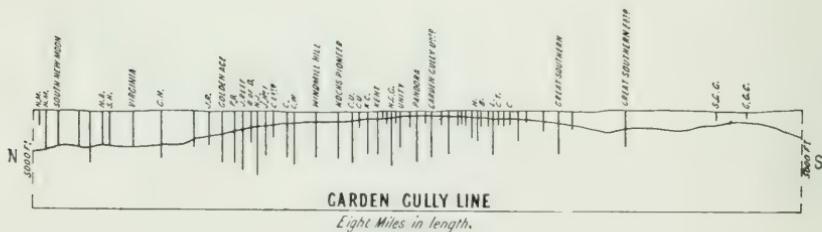
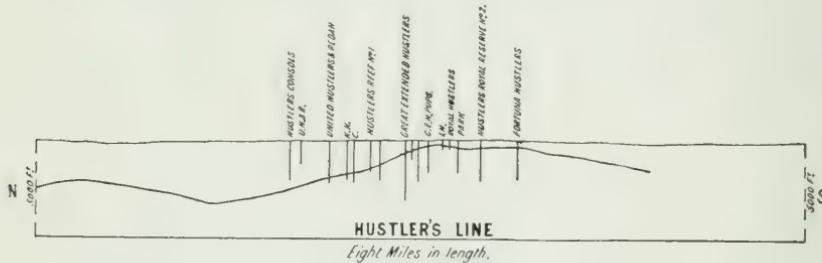


FIG. 8.—Longitudinal sections along the three principal axial lines of reef, Bendigo, showing the "pitch lines" of the strata and saddle reefs.

(Scale, Horizontal and Vertical—2 miles to an inch.)

CASTLEMAINE.

The Castlemaine or Mount Alexander diggings were worked in 1851, when the rich shallow alluvial ground was turned over from end to end; in recent years much of the same ground has been profitably dredged or pump-slued. The quartz formations are chiefly of the saddle type and fault lodes cutting the Lower Ordovician strata, which are folded into a series of anticlines and synclines. (Fig. 11.)

Fault or "blocky" lodes are laminated quartz up to several feet in thickness, with large masses of spurs and veins traceable for hundreds of feet, the spurs forming at times payable stockworks.

Other masses of rich spurs occur, generally in irregular fissures adjacent to the folds and faults, the gold being in patches rather than in shoots. Numerous rich lodes have been mined to various depths. At the present time the deepest mining is being carried on at the Francis Ormond on large bodies of quartz at 900 feet deep, for about payable results.

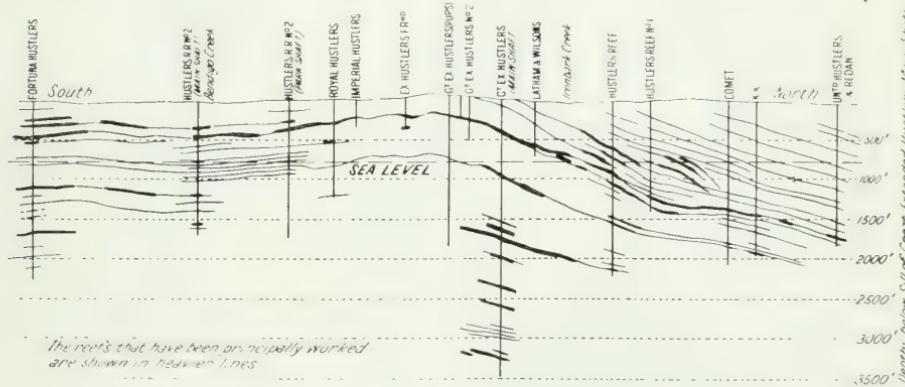


FIG. 9.—Vertical projection along portion of the Hustler's anticlinal axial plane ("line of reef"), Bendigo, showing "pitch" of saddle reefs. Vertical lines are shafts.

(Scale, Horizontal and Vertical—2,400 feet to an inch.)

MALDON.

Maldon is a typical field of contact metamorphism, granite intruding Lower Ordovician sedimentaries. The schists and hornfels in which the lodes occur are much folded and traversed by dykes. It is remarkable that the structures of the Ballarat, Bendigo, and Maryborough fields are all represented amongst its lodes. Lodes of the fault type cut the strata, occasional saddles occur as at the North British mine, and quartz lodes, in some cases up to 15 feet wide, are directly associated with dyke walls, as at the Derby mine. The character of the quartz varies from a regular laminated stone to a sparry lode formation, and the shoots of gold have been found to coincide with intersecting favorable beds. Several mines have yielded rich returns:

	Tons.	Oz.	Dividends.
Beehive mine to 1897	£ 132,000 —
Union mine to 1897	177,870 ..
South German mine to 31st Dec., 1913	178,340	166,680 | 341,100

LAURISTON.

Lauriston is a Lower Ordovician saddle-reef field, but profitable mining has been mainly on an inverted saddle or "synclinal" reef, the Russell's lode. On this syncline a number of inverted saddles have been prospected and mined to a depth of 1,034 feet, yielding gold to the value of £184,186.

West of the main syncline saddles occur on the Energetic anticline. These have been mined in the northern area for £100,000 worth of gold.

In the Drummond North area the O'Connor lode has been mined to 870 feet deep, and a yield of 38,791 oz. obtained from 43,322 tons of quartz. This was a small eastern dipping lode cutting western beds, and not of the saddle type.

MARYBOROUGH.

Maryborough is an extensive gold-field in Lower Ordovician slate and sandstone beds, which are folded into a series of anticlines and synclines, and traversed in every direction by dykes of porphyry, porphyrite and lamprophyre. The main structures are lenses associated with lamprophyre dykes on either wall, and large lode channels with main veins and stockwork spurs adjacent to lamprophyre dykes with horizontal offshoots of dyke cutting them.

The Leviathan mine, of the second type, has been worked to 960 feet deep, but the main stoping is from the surface to 560 feet deep; from here the yields were 148,669 tons for 50,621 oz.

Veins of the "indicator" class also are mined in the western belts of Waterloo and Alma.

CLUNES.

Clunes, the oldest gold-field of Victoria, discovered on 1st July, 1851, was one of the pioneer quartz mining fields of the State, and the lodes were extensively worked until the early nineties. They are of the saddle type, in slate and sandstone beds which are probably of Lower Ordovician age, and are known as the Eastern, Western, Robinson's, Old Man, New Eastern and Welcome.

The quartz was mined from 5 to over 50 feet in width, and to a depth of 1,100 feet. The deepest shaft, the Clunes Quartz, reaches 1,745 feet.

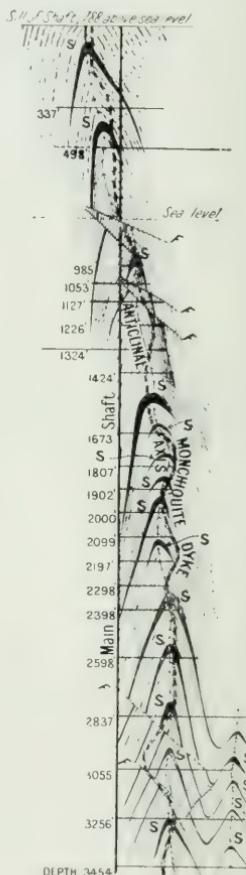


FIG. 10.—Transverse vertical section at Great Extended Hustler's shaft, Bendigo, showing saddle reefs and monchiquite dyke ("lava") in "centre country." S, saddle reefs; F, faults. This shaft is shown also in Figs. 7 (Section 2), 8, and 9.

(Scale—800 feet to an inch.)

Some of the yields are :—

Clunes Quartz Company crushed 1,204,908 tons for 514,886 oz., paid £481,455 in dividends.

New North Clunes Quartz Company crushed 500,000 tons for 253,373 oz., paid £750,000 (approximately) in dividends.

The yields recorded from the Clunes gold-field, including alluvial and quartz, total 1,338,882 oz., valued at £5,498,346.

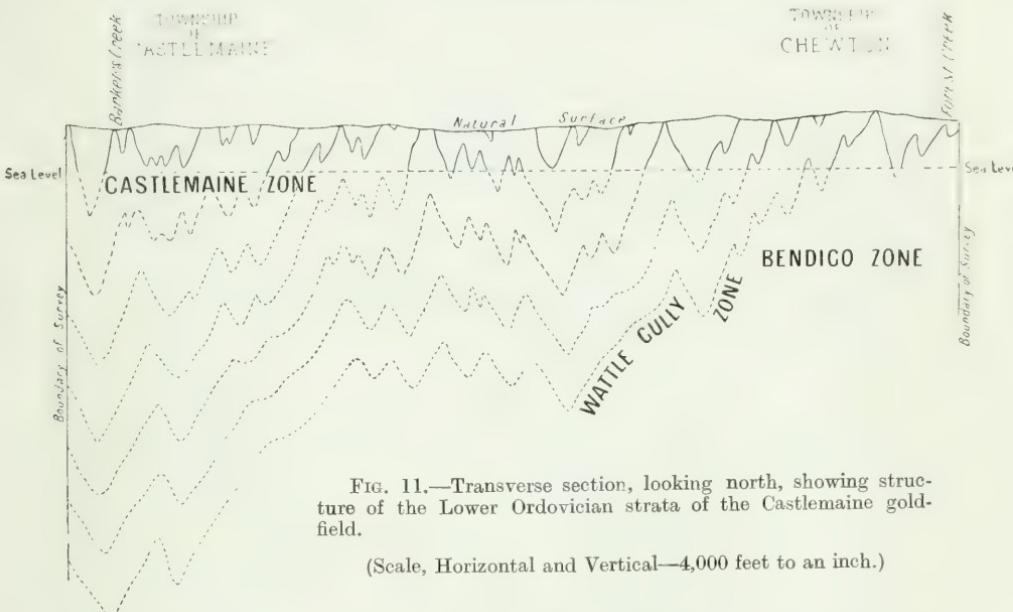


FIG. 11.—Transverse section, looking north, showing structure of the Lower Ordovician strata of the Castlemaine gold-field.

(Scale, Horizontal and Vertical—4,000 feet to an inch.)

ST. ARNAUD.

St. Arnaud is a Lower Ordovician area in which deep quartz-mining has been highly profitable. The chief lodes are the Lord Nelson group of five, which dip westward at a slightly greater angle than the highly inclined western dipping beds. No regular folds have been seen adjacent to these lodes, but deflection of the beds by faulting has been noted. The auriferous lodes are generally laminated; large masses of quartz also occur near them in sparry formations mostly barren. The ore bodies vary from 300 to 900 feet in length, the width being from a few feet up to 40 feet in the No. 13 level, where massive veins and country rock were mined. A typical example of a rich lode having extensive barren portions or blanks in it was rich from the surface to 400 feet deep, barely payable to unpayable to 750 feet, then highly payable from 750 feet to about 1,600 feet deep, below which there has been a falling off in values. The shaft is now 2,405 feet deep.

To the end of 30th June, 1913, the returns from the Lord Nelson mine were 612,061 tons for 318,973 oz.; dividends, £265,350.

Besides the above type, there are lodes associated with dykes, as the New Bendigo line; and rich indicator veins, as the Garibaldi, where one pocket yielded £2,000 worth of gold.

STA WELL.

This is a contact field of schist and quartzite beds having extensive lodes of the saddle and other types. Three main parallel lodes have been mined, viz.:—the Cross, the Scotchman's and the Magdala. The Scotchman's main shaft is 1,030 feet deep; at some levels the profitable stone was mined for a length of 400 feet. The Magdala shaft is 2,425 feet deep; between the 900 and 1,400-ft. levels payable quartz 30 feet in width was mined for a length of 300 feet. Diagonal and spurry veins also have been worked profitably on a large scale. Dykes of elvan and others similar to the "lava" type of Bendigo have been noted, but neither has any apparent influence on the auriferous lodes, which were formed prior to the dyke intrusions. Highly mineralized laminated quartz from 2 up to 37 feet thick (when associated with spurs) has been mined in the Stawell lodes, the richest gold being near the junction of large flat quartz veins with the main lodes. The yield from the Cross Reef Quartz Company for five and three-quarter years, prior to 1876, was 120,926 tons for 177,940 oz.: £490,242 was paid in dividends.

An approximate estimate of the gold from the Stawell lodes is 500,000 tons for 600,000 oz.; dividends, £1,270,000.

WALHALLA.

The Walhalla field is within a Silurian area of slate and sandstone beds bent into numerous corrugations and folds in a great geosyncline (Fig. 12)

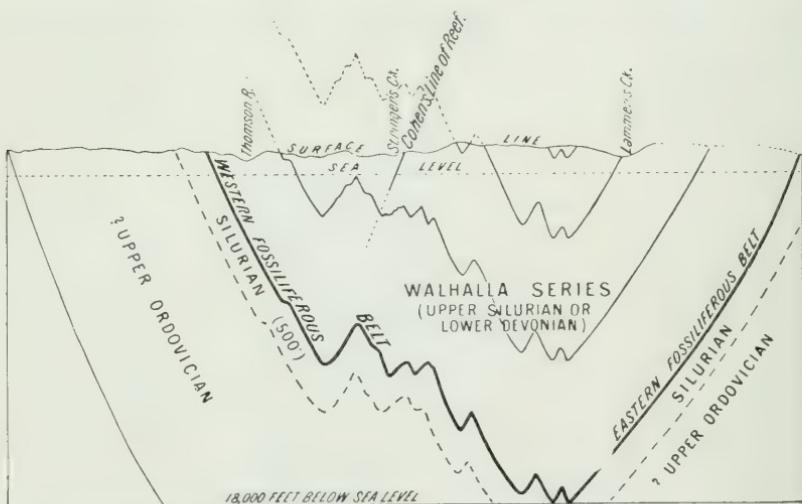


FIG. 12.—Section, looking north, showing folding and succession of strata of Walhalla gold-field, also structural position of Cohen's reef, the most productive shoot of stone in Victoria.

(Scale, Horizontal and Vertical—2 miles to an inch.)

and containing a series of dykes and quartz lodes. Chief is Cohen's line of reef, worked extensively and profitably by the Long Tunnel and Long Tunnel Extended mines. This lode is highly laminated and associated directly with a quartz-mica-diorite dyke intruded prior to the deposition of the lode along

a main fault line traceable for thousands of feet in length. The gold shoot, which pitches north to 1,200 feet deep, and then south at a high angle, is somewhat of a boomerang shape (see Fig. 13). Down to the 2,000-ft. level the stopes on the main shoot of Cohen's line are equal to a block 2,500 feet deep by 1,000 feet long, and 6 to 7 feet wide. The lode has been worked to 3,375 feet from the surface, and shaft sinking below that level is proceeding. Cohen's line has yielded (to November, 1913) 1,477,094 oz. of gold, and paid £2,378,290 in dividends, of which £1,283,400 has come from the Long Tunnel mine.

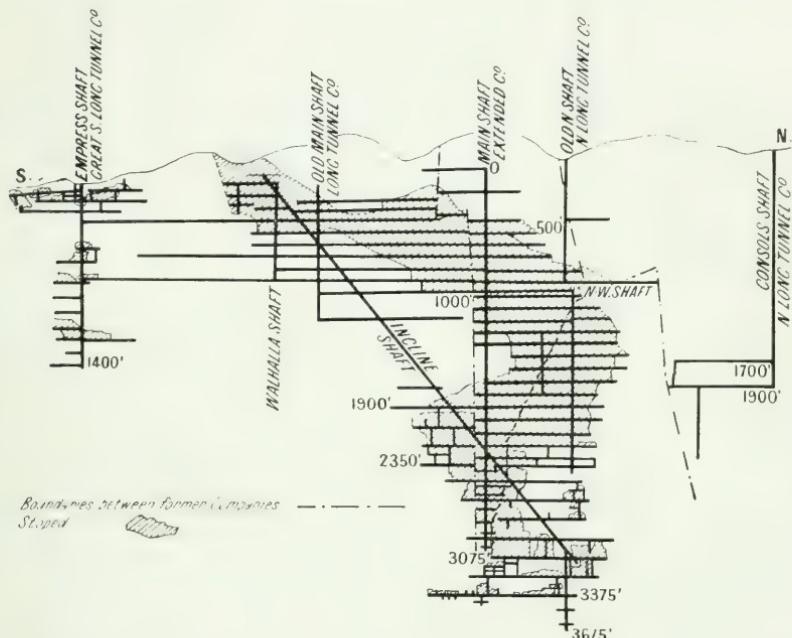


FIG. 13.—Longitudinal vertical projection, Cohen's line of reef, Walhalla. (Gold won, 1,477,094 oz.; dividends paid, £2,378,290.)

(Scale—1,500 feet to an inch.)

Other fields to the north of Walhalla are Toombon, Aberfeldy, Fulton's Creek and Donnelly's Creek.

WOOD'S POINT.

The Wood's Point field is within an area of folded Silurian shales and sandstones, &c., with Upper Ordovician strata on either side. The main feature of the field is the occurrence of auriferous quartz reefs or "floors," more nearly flat than vertical, in wide portions or "bulges" of diorite dykes. A typical transverse section is shown in Fig. 14.

The New Loch Fyne, Morning Star, Working Miners' and A1 mines are typical "dyke-bulge" mines. The thickness of the quartz floors is sometimes 10 to 20 feet in the largest mines. In the Morning Star (bulge 1,700 feet long by 200 feet to 300 feet wide) two sets of quartz floors occur, one set dipping across, and the other along, the strike of the dyke; to a depth

of 730 feet thirteen distinct reefs or floors have been proved, and to water-level, about 400 feet deep, the approximate yield is £1,040,000.

The New Loch Fyne has been worked 700 feet in length by 200 feet wide, and to a depth of 500 feet, proving a dozen or more floors of quartz. From this mine the yield of the last company alone is 117,930 tons for 86,029 oz., value £304,056; dividends, £109,700.

The A1 bulge (500 feet by 140 feet) is really silicified sedimentary rock between two dykes, in which the quartz floors are extensive and often rich, one mined being 400 feet long, up to 140 feet wide, and as thick (high) as 30 feet. The workings are 800 feet deep. The yields total over £300,000 worth of gold.

BETHANGA AND CASSILIS.

Refractory auriferous sulphide ores are found in many of the lodes of the schist and gneiss areas of eastern Victoria; the most important are at Bethanga, Upper Murray and Cassilis in East Gippsland. At Bethanga the lodes are vertical, or dip west as they cut through the highly contorted Archæan (?) rocks, and though rich in free gold in the gossan portion near the surface, they "make" into sulphides at 50 feet deep. The ores are highly arsenical, and proved refractory to treatment until 1896, when they were found to be amenable to treatment by chlorination. Yields of about 27 dwt. per ton were obtained for some years. The mines are not now working.

At Cassilis the lodes are somewhat similar in structure and occurrence, but the sulphide ores have proved more amenable to metallurgical treatment than at Bethanga. The main Cassilis lode has been from 3 feet up to 7 feet in width, and the ore-bearing portion about 400 to 500 feet in length. The present company (whose shaft is down 850 feet from a tunnel) has treated 110,704 tons for 91,857 oz., and paid in dividends £14,100.

(c) ALLUVIAL MINING.

Deep Leads, Shallow Deposits.—The deep leads of Victoria are Cainozoic river beds now covered by extensive alluvium and volcanic flows (Fig. 15); their aggregate length is several hundred miles, not reckoning minor tributaries. The valleys trended generally in a northerly and southerly direction from an old divide closely approximating in position to the present Main Divide. The lowest strata of gravel or "wash" were derived from formations containing much auriferous quartz, and consequently many of the leads proved highly profitable and often immensely rich in gold.

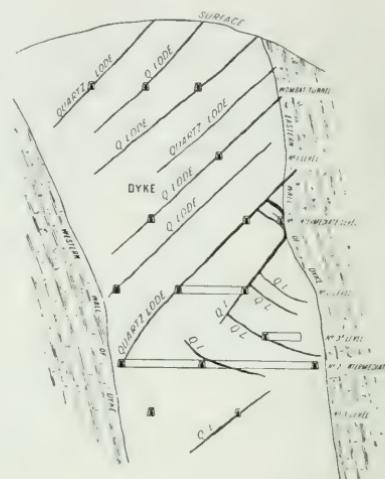


FIG. 14.—Transverse section of New Loch Fyne mine, Matlock, a typical dyke-bulge mine of the Wood's Point district.

(Scale—200 feet to an inch.)

The high level gravels, above the deep leads and present streams, already described under Cainozoic, have also yielded much gold. The shallow detrital deposits in the beds and banks of present water-courses were the source of the easily-won fortunes that fell to the lot of many a lucky digger at the numerous "rushes" in the first days of gold-mining in Victoria.

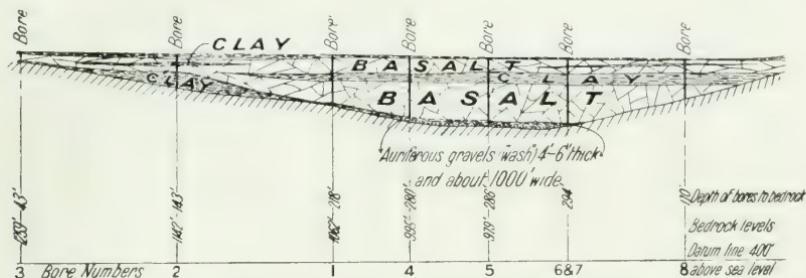


FIG. 15.—Section of auriferous sub-basaltic deep lead at Trawalla, located by boring during 1912.

(Scale—Horizontal, 1,600 feet; Vertical, 800 feet to an inch.)

The chief centres in the earlier and more prosperous years of alluvial mining were Ballarat, Bendigo, Creswick, Castlemaine, Talbot, Moliagul, Maryborough, Ararat, Stawell, Chiltern, Rutherford, Ovens Valley and Beechworth.

Deep leads about 700 feet below the surface are known in Victoria; the deepest workings are at 512 feet; the leads worked are commonly between 200 and 300 feet in depth. Their distribution is shown on Plate II.

The value of gold won from alluvial mining is probably not less than £150,000,000.

At Ararat, Beaufort (Fiery Creek), Poseidon, Chiltern and Rutherford deep alluvial mining is now in progress; new leads are still being systematically searched for and are frequently found both by Government and by private enterprise.

Bucket-dredging and Pump-sluicing.—A feature of alluvial mining for the last thirteen years has been the treatment in bulk of low-grade auriferous alluvial deposits and their overburden, to depths occasionally exceeding 40 feet, by bucket-dredges and by pump hydraulic sluicing plants on barges. During 1912 there were 55 bucket dredges, 26 pump-sluicing plants and 12 jet elevators at work; they treated 19,629,865 cubic yards (in place) of material for 73,214 oz. of gold, an average of 1.8 gr., or 3.6 pence per cubic yard; and paid £32,320 in dividends. From 1900 to 1912 the material treated was 189,075,667 cubic yards, the gold won 881,806 oz., valued at £3,527,224, the average per cubic yard 2.23 gr., the area worked 6,569 acres, and the average yield per acre 134.2 oz.

Nuggets.—No alluvial gold-fields in any part of the world have been so prolific in large nuggets as those of Victoria. The western portion of the State, between Ballarat and Bendigo on the east and Wedderburn and Ararat on the west, is noted for nuggets, the largest of which have been found at Ballarat, Moliagul, Rheola, Kingower, Dunolly, Maryborough, Tarnagulla and Wedderburn.

Five of the largest nuggets found in Victoria are :—

Name.	Locality.	*Gross Weight.	Depth from Surface.
The Welcome Stranger ..	Moliagul ..	2,520 oz.	1 inch
The Welcome ..	Ballarat ..	2,217	180 feet
The Blanche Barkly..	Kingower ..	1,743	13 feet
The Precious ..	Rheola ..	1,717	12 feet
The Canadian ..	Ballarat ..	1,619	60 feet

* Net weight is somewhat less.

Of the Victorian nuggets on record there are 12 over 1,000 oz., 53 over 500 oz., 412 over 100 oz. Many have been found close to the surface; others have been mined at depths down to 400 feet in the deep leads. Some have been solid, clean lumps of gold; others have been associated with ferruginous material and quartz, suggesting their derivation from adjacent reefs or veins, probably often of the indicator class. The gold-fields in which indicators have been found are confined to the nugget area of west central Victoria.

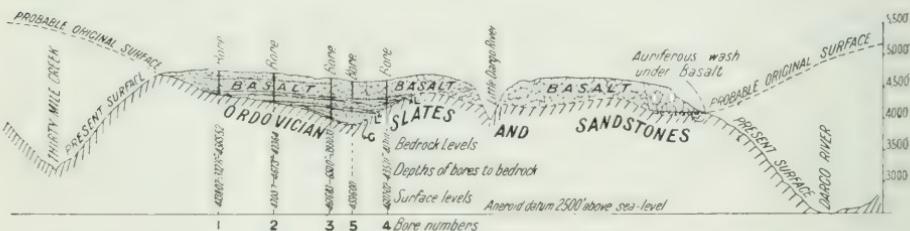


FIG. 16.—Section across Dargo High Plains showing high-elevation sub-basaltic deep lead; also shows great vertical erosion during Cainozoic times.

(Scale—Horizontal, 9,000 feet ; Vertical, 3,000 feet to an inch.)

That many large nuggets may still remain to be found has recently been demonstrated by rich discoveries at the Nick O'Time and Poseidon fields, near Tarnagulla.

Though so far comparatively unimportant as gold producers, the sub-basaltic leads of the Dargo High Plains are of much interest and value in affording striking evidence of great physiographic changes in Cainozoic times (See Fig. 16.)

5.—Coal.

(a) BITUMINOUS COAL.

In Victoria bituminous coal is found in Jurassic strata situated in the southern portion of the State in three main areas, the Wannon, Otway and South Gippsland. Considerable portions of these Jurassic areas are overlain by Cainozoic rocks.

The Wannon area of about 400 square miles is comparatively unprospected owing to almost the whole of the land having been sold prior to 1892, when an Act was passed reserving to the Crown all coal on lands alienated thereafter.

In the Otway area, estimated at about 1,000 square miles, 13 bores, aggregating 18,776 lineal feet, have been sunk, but without disclosing seams more than a few inches thick.

The South Gippsland area occupies about 2,100 square miles. Seams therein of or approaching payable thickness are at present known only within a belt about 50 miles long and 10 miles wide, running north-eastward from Kilcunda to Morwell.

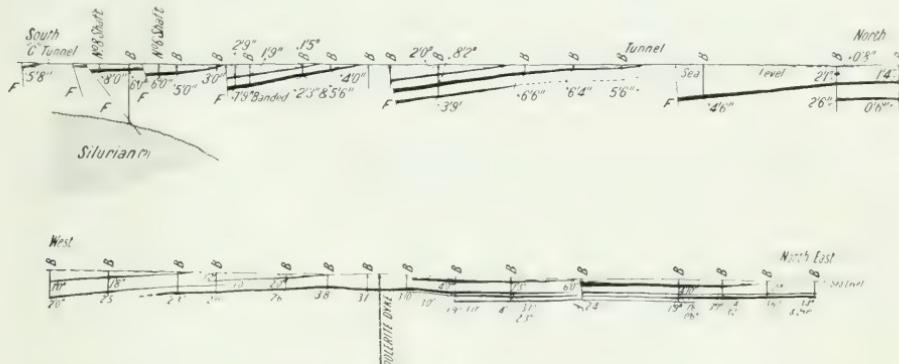


FIG. 17.—Sections, north-and-south and east-and-west, State Coal Mine, Wonthaggi, showing local character of Jurassic coal seams. B, bores; F, faults. Figures denote thickness of coal.

(Scale, Horizontal and Vertical—About 4,000 feet to the inch.)

Mining is now being carried on at Kileunda, Wonthaggi, Outtrim, Jumbunna and Korumburra on seams which, with the exception of Wonthaggi, rarely exceed 3 feet in thickness. The maximum thickness of any seam is about 9 feet.

Coal of payable thickness, but of undefined extent, has been proved in bores at Woolamai, Outtrim Flats, Koorooman, Mardan, Boolarra, Hazelwood and Coalville.

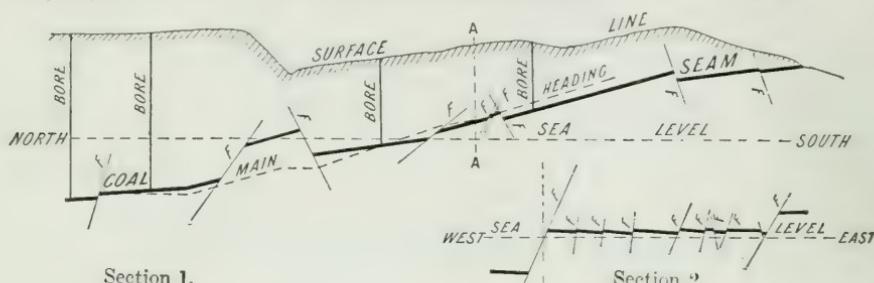
The seams have usually been considered as of drift origin, but recent investigation favours the swamp growth theory.

The local and irregular character of the seams, and the disturbed nature of the strata, render boring at close intervals necessary. Figs. 17 and 18 show the structure at two of the principal mines. Up to the end of 1912 the Government had put down for black coal 600 bores, aggregating 344,800 lineal feet, at an expenditure of about £180,000. The output for the same period amounted to 4,667,000 tons, valued at £2,436,000.

For the year 1912 the output totalled 589,143 tons, valued at £258,455. Of this the State Coal Mine, Wonthaggi, contributed 455,658 tons, valued at £184,056.

Around the State Coal Mine, Wonthaggi, sufficient boring has been done to show that there is about 20,000,000 tons of payable coal yet to be extracted. The privately-owned mines have not been prospected ahead of the working faces as energetically as the State mine, but there is little doubt that the present output of some of them can be maintained for many years ahead.

The Korumburra District is now being systematically bored. Probably 10,000,000 tons of coal at least will be available there.



Approximately East & West at A.A. Section 1.

FIG. 18.—Sections of Jumbunna Coal Mine, Jumbunna, showing Jurassic black coal seam averaging about 3 feet 6 inches thick. F, faults.

(Scale, Horizontal and Vertical—18 chains to 1 inch.)

The following are some typical analyses from various districts in Victoria :—

Mine or Locality.	H ₂ O.	Vol. H.C.	Fixed Carb.	Ash.	B.T.U.
State Mine, No. 3 shaft	5·28	28·78	57·10	8·84	12,222
State Mine, No. 10 shaft	8·43	27·56	56·08	7·93	12,038
Wonthaggi East (Bore No. 2, Kirrak)	7·02	28·60	53·41	10·97	11,623
Outtrim Mine	4·87	29·58	60·25	5·26	12,822
Austral Mine (Bore No. 33, Korumburra)	4·72	31·40	56·73	7·15	*12,930
Jumbunna	5·04	27·25	62·94	4·77	13,029

* Calculated.

Victorian coal commands a high price for domestic use, although unsuitable for gas or coke production.

It is improbable that large bituminous coal-fields will be opened up in Victoria, but the work of prospecting such resources as the State possesses is in steady progress.

(b) BROWN COAL.

The brown coal beds of Victoria are probably the thickest yet recorded in the world. At Morwell 780 feet of coal was passed through in a bore 1,010 feet deep. Apart from numerous small beds, which are widely distributed, and which will probably be used to supply power for local use, there are four principal areas, viz. :—

	Approximate Area.	Probable Average Thickness of Coal.	Approximate Thickness of Overburden.
Lal Lal	Square Miles. 3	Feet. 80	60 feet (average)
Altona	200	50	200 to 400 feet
Morwell	700	50	Surface to 500 feet
Alberton	300	50	45 feet

In many parts of the above areas more than a 50 per cent. extraction will probably not be made. In the utilization of this class of fuel, of

which the State contains probably as much as 30,000,000,000 tons. Victoria may ultimately find compensation for her comparative poverty in black



FIG. 19.—Section across Latrobe Valley, Traralgon, showing trough faulting of Cainozoic age and the occurrence of thick beds of brown coal.

(Scale—Horizontal, 1' 0 chains ; Vertical, 3,000 feet to an inch.)

coal. The occurrence of the brown coal seams is illustrated in Figs. 19 and 20. A typical proximate analysis of freshly mined Morwell brown coal is as follows :—

H ₂ O	..	..	..	..	53·00 per cent.
V.H.C.	..	..	..	..	24·50 ..
F.C.	..	..	..	..	21·50 ..
Ash	..	..	..	..	1·00 ..
					100·00 ..
Sulphur	..	..	..	..	0·7 ..
Nitrogen	..	..	..	..	0·3 ..
Calorific value	..	..	..	..	5,500—6,000 B.T.U.
Evaporation value	..	..	..	..	4-lb. water
Gas, per ton	..	..	..	..	6,500 cubic feet
Ammonium Sulphate, per ton (theoretical)					32 lb.



FIG. 20.—Section across Corner Inlet, showing Cainozoic faulting and thick beds of brown coal.

(Scale—Horizontal, 3 miles ; Vertical, 3,000 feet to an inch.)

The geological and geographical distribution of the various brown coal seams is at present being ascertained by boring operations ; the cores are being systematically tested for calorific value, gas production and by-products. Briquetting will probably one day be, as in Europe, commercially successful.

6.—Other Economic Products.

Ores of all the commoner metals also occur in Victoria. Some, however, are found in small quantities, or in localities where the conditions render them of doubtful economic value at present.

Antimony.—The ores found are the oxide and the sulphide. They occur in veins of quartz in dykes and lodes traversing the Silurian, and occasionally in small patches in the Ordovician. Considerable quantities are found at Costerfield, where £31,424 worth was mined during 1913. The total yield for Victoria up to the end of 1913 is valued at £272,298. At present about 55 tons of sulphide concentrates, containing $2\frac{1}{4}$ oz. of gold per ton, is being shipped to England weekly.

Arsenic.—Arsenical pyrites occurs at Bethanga and Cassilis among complex sulphide ores. It also occurs in small quantity in quartz reefs and veins, as at Stawell and Ballarat. No statistics are available as to the amount of arsenic produced. It is marketed as a by-product from furnaces roasting auriferous sulphides.

Bismuth.—Small quantities of metallic bismuth, and some oxide, carbonate and sulphide have been recorded from Redbank, Lintons, Wombat Creek and Maldon. An interesting compound of gold and bismuth occurs at Maldon, and has been named "maldonite."

Copper.—Copper ore is found mostly as a sulphide dissemination, or in solid veins of sulphide, associated with hornblendic dykes. At Thomson River copper has been mined, the ores being oxides and carbonates in the upper levels, with sulphides below. The ore is either within the dyke or as a wall vein between it and the Silurian strata. Platinum and palladium also occur in appreciable quantities in association with the copper sulphide ores of this lode and dyke. At Mount Dreddick sulphide ore and some carbonates of copper occur in lodes and dykes in granodiorite. Other localities are Dark River, Heathcote, Bethanga, and Cassilis. The Victorian copper yield is 18,730 tons, and the value £215,797; the platinum to 1913 was 311 oz.

Iron.—Iron ores occur more or less throughout the several rock formations of Victoria, the common forms being limonite and haematite. In the Tertiary formations irregular masses are found, as at Lal Lal and Mirboo North: in the porphyry rocks of East Gippsland lodes of considerable extent are known at Nowa Nowa. The output so far has been only 5,434 tons, valued at £11,540.

Lead.—Lead ores occur in small quantities as galena in quartz lodes on most of the gold-fields, as at Percydale and St. Arnaud. In the Omeo, Cassilis and Bethanga districts galena is associated with the complex sulphide ores. At Mount Dreddick galena lodes have been mined in the granodiorite formations, and at Wombat Creek and Buchan patches of solid galena occur in the crystalline limestones. So far the occurrences have not been extensive enough for profitable mining. The yield from lead ores in Victoria is 793 tons, valued at £5,750.

Manganese.—This ore is of fairly common occurrence in small quantities in lodes and dykes. Massive manganese oxide with iron oxide occurs in porphyry at Nowa Nowa and Mount Tara in East Gippsland, but little ore has been mined. A yield of 45 tons, valued at £212, is the only one on record. A company recently formed proposes to work deposits near Buchan.

Molybdenum.—Molybdenum ores occur in dykes and granitic areas, but so far they have been found only in small patches, except at Wangarabell, in East Gippsland, where a lode traversing a granite area contains molybdenite in sufficient quantity to be of probable economic value.

Platinum.—See *Copper*.

Silver.—Occurs as a minor product in the bullion of the gold mines. A rich gold and silver lode was worked near St. Arnaud about 1860; the proportion of silver to gold was two to one.

Silver lodes, which may prove of commercial importance, have recently been discovered near Omeo.

Tin.—As stream tin in the Cainozoic formations, this ore has been mined at Beechworth, Eldorado, Upper Murray, Toora and the Latrobe Valley. In the north-eastern district, around Tallandoon and Eskdale, cassiterite-bearing greisen and pegmatite segregation veins or dykes traverse the schist formations; this belt (which is at present receiving a good deal of attention from prospectors and investors) extends southward to Glen Wills. To the end of 1912 the tin yield of Victoria was 15,715 tons, valued at £782,680. A pump-sluicing plant, erected at a cost of over £30,000, has recently started work at Toora.

Tungsten.—The ores of tungsten in Victoria are wolfram and scheelite, occurring in lodes in Ordovician strata, as at Lintons and Chilfern. At Mount Murphy, Benambra, a wolfram and quartz lode occurs in a granitic and schist formation. The total yield for Victoria is 65 tons, valued at £5,659.

Zinc associated in small quantity with complex ores occurs as sphalerite; the chief localities are Mount Deddick, Omeo and Cassilis. It occurs freely in small quantity in the quartz lodes of many of the gold-fields. It is the "black-jack" of the miner.

Diatomaceous earth occurs, usually associated with Cainozoic volcanic rocks, in many parts of the State, Lillicur being the chief scene of actual operations. The yield to 1913 was 4,893 tons, valued at £19,927.

Gypsum is worked at Boort and Lake Boga in Cainozoic beds. Enormous masses of "copi" or earthy gypsum form conspicuous white mounds in the Mallee. The yield to 1912 was 21,198 tons, valued at £14,473.

The *magnesite* deposits at Heathcote are receiving attention, 383 tons having been mined recently.

Marble.—Extensive deposits of high-class marble of varied texture and colour exist north-eastward from Omeo, near Buchan and elsewhere. Some of the Buchan marble is highly regarded by leading London architects, and the vestibule of the Melbourne Public Library illustrates its use for decorative purposes. Better railway communication is likely to lead to the systematic working of some of the deposits in a few years. One quarry is at present in operation.

Mineral Springs.—Eighty-five mineral springs are known in Victoria, and present many varieties in chemical composition. Several of them have already provided sites for popular health resorts.

Underground Water.—Victoria lies outside the great artesian water basins of Australia, but useful local supplies of artesian and sub-artesian water are obtainable in various districts. In the Mallee the Cainozoic beds yield a more or less brackish sub-artesian supply, useful for stock purposes. Bores for deep alluvial leads or brown coal occasionally tap artesian supplies (as recently at Beaufort and Morwell). At Sale, at about 30 feet above sea level, the Latrobe artesian basin gives a surface flow of 78,000 gallons per day.

under a pressure of 12 lb. from a 4-in. bore. Ordinary underground water, tapped by bores or wells, and elevated usually by windmills, is extensively obtained from rocks of various ages throughout the State for stock and household purposes.

Other Minerals.—In addition to the minerals mentioned, diamonds have been found associated with alluvial gold at Beechworth, Chiltern, and Fifteen-Mile Creek, near Mansfield; corundum occurs in a massive form at Mount Wellington, and as small sapphires is common on many gold-fields: osmiridium is found at Turton's Creek, Stockyard Creek and Waratah Bay, all in South Gippsland; barytes occurs as lodes near Dookie, and in East Gippsland it has been worked to a small extent; soapstone or massive talc, formed as a decomposition product of rocks rich in magnesia, is now worked at Heathcote; the annual output of stone for building and road-making, and of clay for brick and pottery making, is already large and is constantly increasing.

7.—Problems Awaiting Solution.

Among the technical points in Victorian geology awaiting elucidation are the ages of the various Cainozoic deep-lead systems and brown coals; the age of the glacials, other than those of Baechus Marsh; the ages of large areas of sedimentary, volcanic and plutonic rocks, provisionally attributed to various epochs of the Ordovician, Silurian, Devonian and Carboniferous systems; the ages of the dykes intruding various formations; the existence of passage beds between the Cambrian and Ordovician, the Silurian and Devonian, the Devonian and Carboniferous; the distribution and extent of the pre-Ordovician rocks; the separation of Ordovician and pre-Ordovician rocks in the north-east; the ages of auriferous quartz reefs of any field, and of the various fields; the more accurate mapping of the various major and minor folds in the older rocks, and the cause of the regularity of plication; the age, amount, and direction of the principal earth movements, and their association with igneous action; the grouping of the igneous rocks into petrographical provinces; the more thorough investigation of many richly fossiliferous localities, representing several epochs, that have hitherto received scant attention from the palaeontologists; the correlation of Victorian formations with those of other States. Persons with a commercial rather than a scientific tendency will perhaps be more interested in investigations to ascertain the causes of the location of rich deposits of gold at the intersection of indicators with quartz reefs, of the association of certain strata and dykes with auriferous shoots, of the occurrence of certain economic metalliferous minerals with certain kinds of igneous rocks; the distribution and quality of the brown coal and lignites, their use for household fuel, power production, and manufacture of by-products; the trend and value of many probably important deep leads not yet located; the coal-bearing horizons of the Jurassic rocks; whether and where definitely favorable auriferous zones (in addition to a few already known) exist in the Silurian, Ordovician and metamorphic rocks; to point the way, if possible, to successful mining for gold in localities where auriferous lodes may occur at workable depths while giving no indication to the casual observer of their existence at the surface; to develop by mapping in the field and by laboratory tests the home production

of gypsum, limestone, clays, kaolin, sands, felspars, pigments, diatomaceous earth and other materials and minerals used in the arts and industries; to search for phosphatic deposits—in this direction some success has already been attained ; and to develop, if possible, commercial products in extensive areas hitherto almost barren of utility, such as those occupied by the Devonian rocks. There is clearly work ahead for all comers.



SCIENTIFIC AND TECHNICAL SOCIETIES IN VICTORIA.

Australasian Institute of Mining Engineers.
Field Naturalists' Club of Victoria.
Geelong Field Naturalists' Club.
Historical Society of Victoria.
Medical Society of Victoria.
Melbourne University Engineering Society.
Odontological Society of Victoria.
Pharmaceutical Society of Victoria.
Royal Agricultural Society of Victoria.
Royal Australasian Ornithologists' Union.
Royal Geographical Society, Victorian Branch.
Royal Society of Victoria.
Royal Victorian Institute of Architects.
Royal Zoological and Acclimatisation Society of Victoria.
Society of Chemical Industry of Victoria.
Victorian Institute of Engineers.
Victorian Institute of Surveyors.
Victorian Microscopical Society.



LEADING STATISTICS OF THE STATE FOR THE LATEST YEAR AVAILABLE.

AREA ..	..	56,245,760 acres (87,884 square miles).
POPULATION ..	..	State, 1,412,119 ; Melbourne and Suburbs, 651,000.
VITAL STATISTICS ..	..	Birth Rate, 26·45 ; Marriage Rate, 8·67 ; Death Rate, 12·25 per 1,000 of Population.
EDUCATION ..	..	State Schools : Number, 2,093 ; Scholars, 238,111. Private Schools : Number, 548 ; Scholars, 56,035.
FRIENDLY SOCIETIES ..	..	Number of Members, 153,921 ; Amount of Funds, £2,361,464.
LIFE ASSURANCE ..	..	Number of Policies, 331,846 ; Amount Assured, £40,132,346.
SAVINGS BANKS ..	..	Number of Depositors, 710,512 ; Amounts Deposited, £22,813,453.
OVERSEA TRADE ..	..	Value of Imports, £25,081,074 ; Value of Exports, £19,113,121.

VALUE OF PRINCIPAL ARTICLES EXPORTED OVERSEA—

	£		£
Wool ..	6,990,918	Butter ..	1,545,771
Breadstuffs (Wheat, Flour, and Biscuit) ..	2,476,819	Hides and Skins ..	1,329,400
Gold ..	3,216,615	Frozen Meats ..	889,297
SHIPPING ..		Tallow ..	324,497
FACTORIES ..		Vessels Entered and Cleared : Number, 4,784 ; Tonnage, 10,836,947.	
AGRICULTURE ..		Hands Employed, 116,108 ; Wages Paid, £10,102,244 ; Value of Machinery, Land, and Buildings, £19,457,795 ; Value of Output, £45,410,773.	

PASTORAL AND DAIRYING—

Live Stock—		Wool Produced	Value £3,751,083
Horses ..	No.	530,494	Butter Made .. 3,478,640
Dairy Cows ..	,	655,939	Cheese Made .. 125,480
Other Cattle ..	,	852,150	
Sheep ..	,	11,892,224	
Pigs ..	,	240,072	

VALUE OF VICTORIAN PRODUCTION—

	Total	Per Head of Population.
	£	£ s. d.
Cultivation	12,429,657	9 3 7
Dairying and Pastoral	11,752,983	8 13 7
Mining	2,499,695	1 16 11
Forest Produce	806,250	0 11 11
Miscellaneous	2,019,707	1 10 3
 Total Primary Products	29,538,292	21 16 3
Manufacturing—Added Value	17,752,167	13 2 1
 Total	47,290,459	34 18 4

MINERAL PRODUCTION—

	£	£	
Gold	2,039,464	Antimony	16,162
Coal, Black	258,455	Other Minerals	184,748
,, Brown	866		
		Total	2,499,695

POSTAL Number of Post Offices, 1,730 ; Letters dealt with, 175,588,805 ; Newspapers, 37,826,929 ; Telegrams transmitted, 2,969,237 ; Telephone Subscribers, 26,562.

RAILWAYS .. Miles open, 3,652 ; Passengers carried, 113,430,526 ; Gross Receipts, £5,222,271 ; Net Receipts, £1,617,270 ; Capital Cost, £47,076,911.

PUBLIC FINANCE .. State Revenue, 1912-13, £10,287,285 ; State Expenditure, £10,239,676 ; Public Debt, £62,776,724.



INDEX.

	PAGE		PAGE
Aborigines ..	.. 80	Closer Settlement— <i>continued</i> .	
Accident Insurance ..	.. 214	Agricultural Labourers' Allot-	252
Ages of the People ..	.. 77	ments	247
Agriculture—		Allotment Valuation ..	249
Crops ..	.. 303	Conditions of payment ..	250
,, yield 1909 to 1913 ..	.. 277	,, residence ..	250
Department of—		Initial Legislation ..	244
Cheese Industry ..	.. 302	Insurance of Improvements ..	252
Chemists' Branch ..	.. 296	Purchase of Land ..	246
Dairy Supervision ..	.. 301	Residence Conditions ..	250
Experiment Farms ..	.. 291	Road Construction ..	247
Farmers' Classes ..	.. 289	Selection of Settlers ..	248
Field Branch ..	.. 298	Summary ..	252
General ..	.. 303	Working Men's Homes ..	252
Honey ..	.. 302	Coloured Persons ..	80
Horticultural ..	.. 299	Counties—Population ..	85
Pig Industry ..	.. 284, 302	Country Roads Act ..	177
Poultry Industry ..	.. 302	Crèches and Free Kindergartens ..	225
Science Branch ..	.. 297	Criminals	241
Sheep Industry ..	.. 302	Daylesford	27
Stallion Examination ..	.. 302	Death Rates, Australia and England ..	88
Stock Diseases ..	.. 301	Density of Population	91
Districts ..	.. 271	Education—	
Education, Agricultural—		Primary—	
Colleges ..	.. 289	Historical Review	103
Departmental ..	.. 290	Infant Schools	115
Primary and High Schools ..	.. 288	Present Condition	107
University ..	.. 289	Registered Schools	118
Journal of ..	.. 290	Rural Schools	111
Live Stock—		Special	116
Cattle ..	.. 282	State	108
Dairy Cows ..	.. 283	Town	112
Health of ..	.. 288	Training of Teachers	117
Horses ..	.. 284	Secondary—	
Pigs ..	.. 284	Registered Schools	122
Sheep ..	.. 281	State	119
Rainfall ..	.. 271	Technical	127
Summary of Production ..	.. 303	University	129
Art Galleries ..	.. 146	Affiliated Colleges—	
Assisted Immigration ..	.. 95	Ormond	135
Astronomical Problems ..	.. 64	Queen's	136
Bacchus Marsh, Excursions to ..	.. 1, 25	Trinity	135
Ballarat, Excursion to ..	.. 10	Emerald, Excursion to	8
Bendigo ..	.. 15	Engineering, Diversity in Methods ..	190
Benevolent Asylums ..	.. 223	Excursions—	
Birthplaces of the People ..	.. 79	Bacchus Marsh	1
Buchan Caves ..	.. 27	,, Irrigated Area	25
Cattle ..	.. 282	Ballarat	10
Cement Creek, Excursion to ..	.. 4	Bendigo	15
Characteristics of the People ..	.. 93	Cement Creek	4
Charities (<i>see</i> Public Hospitals and Charities).		Creswick	14
Chinese ..	.. 81	Emerald	8
Closer Settlement—		Laanecoorie	19
Administration ..	.. 245	Macedon	6
Advances to Settlers ..	.. 251	Marysville	3
		National Park	21

INDEX—*continued.*

	PAGE		PAGE
Excursions— <i>continued.</i>		Irrigation— <i>continued.</i>	
Newbridge ..	19	Fodder Planting ..	260
Other Places ..	26	Goulburn Scheme ..	263
Turritable Falls ..	7	Legal and Social Features ..	267
Warburton ..	4	Progress, 1909 to 1913 ..	256
Werribee ..	23	“ of Closer Settlement ..	265
Expectation of Life—Victoria and England ..	90	State Aid to Settlers ..	262
Factories, Statistics of ..	210	Labour Laws—	
Flora, Wilson's Promontory ..	22	Apprentices ..	208
Forestry—		Definition of Factory ..	212
Areas and Working Plans ..	310	Manufactury Statistics ..	210
Climatic Effect of Denudation ..	331	Shops ..	207
Coniferous Plantations—		Wages Boards ..	203
Bull or Western Yellow Pine ..	328	Increase of Wages ..	208
Corsican Pine ..	326	Libraries, Museums, &c.—	
Douglas Fir ..	327	Library, Public ..	138
Menzies' Spruce ..	328	Museum, National ..	148
Monterey Pine ..	325	“ Technological ..	152
Pinaster ..	327	Museums, other ..	152
Redwood ..	327	National Gallery ..	146
Conifers, Great Britain and Victoria ..	329	Other ..	144
Instruction ..	332	Life Assurance ..	213
Plantations and Nurseries ..	321	Live Stock ..	279
Treatment of Hardwoods ..	314	Local Government—	
Tree Distribution ..	310	Accounts and Audit ..	172
Victorian Timbers ..	314	Borrowing Powers ..	171
Friendly Societies ..	215	By-laws and Regulations ..	166
Geology and Mineralogy—		Constitution of Municipalities ..	161
Coal Mining ..	368	Construction ..	174
Gold ..	348	Contracts ..	173
Other Economic Products ..	371	Councils—Sanitation ..	181
Physiography ..	339	Country Roads Act ..	177
Problems ..	55, 374	Creation of Colony ..	156
Stratigraphical Succession ..	339	Elections ..	164
Geology, Wilson's Promontory ..	22	Establishment ..	156
Gippsland Lakes ..	26	Funds and Revenue ..	168
Horses ..	284	Lands, Municipal ..	167
Hospital Saturday and Sunday ..	226	Legal Proceedings ..	183
Hospitals ..	221	Legislation ..	160
Housing of the People ..	91	Light, Heat, and Power ..	180
Immigration—		Markets ..	180
Area and Population, Common-wealth ..	94	Municipal Association ..	183
State ..	94	“ Councils ..	164
Assisted Immigrants ..	101	Franchise ..	163
Domestic Servants ..	100	Officers ..	166
Early Records ..	95	Origin ..	154
Farm Workers ..	100	Other Powers ..	182
Farmers with Capital ..	98	Period, pre-Separation ..	155
Irrigation Settlement ..	99	Prevention of Fire ..	180
Lads for Farms ..	100	Purchase, &c., of Land ..	174
Metropolitan Aggregation ..	96	Scope and Operation ..	184
Migration, 1851 to 1911 ..	95	Sewers ..	179
Net, 1909 to 1913 ..	102	Statistics ..	185
Nomination System ..	96	Tolls ..	181
Objects of Policy ..	96	Tramways ..	182
Summary of Results ..	101	Urban municipalities, constitution of ..	159
Vital Statistics ..	94	Water Supply ..	180
Infectious Diseases Hospital ..	225	Weighbridges ..	180
Irrigation—		Lorne ..	28
Advantages of ..	258	Macedon, Excursion to ..	6
Closer Settlement ..	262	Marysville ..	3
Compared with Rainfall ..	259	Melbourne, Population of ..	86
Extension ..	266	Mining—	
		Gold ..	348
		Coal ..	368
		Problems ..	55, 374

INDEX *continued.*

	PAGE		PAGE
Mortality Rates ..	90	Poultry Industry ..	302
Mount Buffalo ..	26	Prisoners in Confinement ..	241
Municipalities (<i>see</i> Local Government).		Problems for Solution—	
Museums ..	152	Agriculture ..	45
National Gallery ..	146	Astronomical ..	64
Museum ..	148	Brown Coal ..	58
National Park, Excursion to ..	21	Closer Settlement ..	52
Naturalization ..	82	Education ..	60
Neglected Children ..	225	Forests ..	41
Old-age, Provision for ..	213	General ..	51
Ormond College ..	135	Geographical and Climatic ..	30
Outdoor Relief ..	229	Land ..	37
Penal System—		Live Stock ..	51
History ..	233	Mining ..	55
Hulks ..	234	Politics and Economics ..	59
Indeterminate Sentences ..	239	Production and Export ..	36
Inspector-General ..	235	Soil ..	50
Mark System ..	235	University ..	61
Pentridge ..	237	Wheat ..	49, 53
Population of Goals ..	236	Provident Funds ..	219
Statistics ..	240	Provision for Sickness, Old-age, &c.—	
Ticket-of-Leave ..	235	Accident Insurance ..	214
Young and Aged Offenders ..	238	Friendly Societies ..	215
Pensions ..	219	General ..	220
Pig Industry ..	284, 302	Life Assurance ..	213
Police and Goals, Expenditure on ..	242	Pensions ..	219
Population—		Provident Funds ..	219
Aborigines ..	80	Public Charities ..	221
Age Groups, Death Rates in ..	89	Trades Unions ..	218
Ages of the People ..	77	Unemployment ..	219
Area of Victoria ..	70	Public Hospitals and Charities—	
Australia ..	86	Admission ..	226
Birthplaces ..	79	Balance-sheets ..	229
Birth, Death, and Marriage Rates ..	87	Building Grants ..	229
Characteristics ..	93	Bush Nursing ..	225
Chinese ..	81	Consumptives ..	223
Colonizing Attempts ..	71	Control ..	228
Coloured Persons ..	80	Crèches ..	225
Counties ..	85	Defects ..	231
Death, Causes of ..	90	Government Grants ..	228
Density ..	91	Growth ..	221
Discovery of Australia ..	70	Hospital Saturday and Sunday ..	226
Elements of Increase ..	74	Infectious Diseases ..	225
Expectation of Life ..	90	Inspector ..	229
First Census ..	72	Legislation ..	228
,, Europeans ..	70	Maintenance Grants ..	229
,, Settlement ..	71	Management ..	226
General Remarks ..	93	Outdoor Relief ..	229
Gold Discoveries ..	73	Pensions, Old-age, &c. ..	226
Houses ..	91	Reformatories ..	225
Immigration ..	74, 77	Staff ..	226
Land Boom ..	73	Statistics ..	226
Length of Residence ..	79	Unemployment ..	226
Marriageable ..	82	Public Works—	
Married Women, Ratio of Births to ..	89	Change in Policy ..	191
Melbourne and Other Cities ..	87	Commonwealth ..	187
,, Sydney ..	86	Diversity of Method ..	190
Natural Increase ..	88	Harbors ..	200
Naturalization ..	82	Municipal ..	188
Progress, Recent ..	73	Other ..	188
Rate of Increase ..	74, 77	Railways—	
Sexes Proportion ..	82	Coal Consumed ..	195
Urban and Rural ..	84	Electrification ..	195
		Engineering Construction ..	195
		Extent ..	192

INDEX—*continued.*

	PAGE		PAGE
Public Works— <i>continued.</i>		Railways (<i>see</i> Public Works).	
Railways— <i>continued.</i>		Rainfall	271
Fares	193	Rate of Increase of Population ..	74, 77
Gauges	192	Reformatories	225
Growth	191	Rural Population (<i>see</i> Urban).	
Locomotives	195	Schools, Registered	118, 122
Quadruplication	196	.. State	108
Rolling Stock	193	Scientific and Technical Societies ..	376
Speed	195	Sewerage	198
Suburban Traffic	193	Sheep Industry	281, 302
Roads and Bridges—		Sickness, Provision for	213
Country Roads Board	196	Sorrento	28
Culverts and Bridges	197	Statistics, Leading, of State	377
Local Government	197	Technical Education	127
Policy	196	.. Societies	376
Road Construction	197	Timber (<i>see</i> Forestry).	
Sewerage—		Trades Unions	218
Geelong	199	Trinity College	135
Melbourne	198	Unemployment—Provision for	219
Other Districts	199	University of Melbourne	129
State	187	Urban and Rural Population	84
Water Supply—		Wages Boards	203
Goulburn River	199	Warburton, Excursion to	4
Loan Liability	200	Water Supply	198
Melbourne	198	Werribee, Excursion to	23
Minor Systems	199	Wet Bulb Isotherms	31
Murray River	200	Workers' dwellings	182
National Works	199	Working Men's Homes	252
Sources	198	World—Population of Principal Cities	87
Queen's College	136		



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